

## DOCUMENT RESUME

ED 122 101

CE 007 030

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TITLE How to Design Training Systems.  
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Div. 2.  
SPONS AGENCY Kentucky State Dept. of Child Welfare, Frankfort.  
PUB DATE Jun 73  
NOTE 127p.

EDRS PRICE MF-\$0.83 HC-\$7.35 Plus Postage.  
DESCRIPTORS \*Educational Programs; Guides; Instructional Design;  
Job Analysis; Models; Needs Assessment; Performance  
Based Education; \*Personnel Management; \*Program  
Development; Program Planning; Quality Control;  
\*Systems Approach; \*Systems Development; Task  
Analysis; Teaching Methods; Testing; Training  
Objectives; Training Techniques

## ABSTRACT

A procedural guide for developing personnel training programs, the document presents a model system which is an integration of a training process outline by the Kentucky Department of Child Welfare and the HumRRO systems approach training model. The first chapter, The Systems Approach to Training, provides background information. Chapter 2, Training Systems Analysis, presents the procedures for performing job-task analysis and for determining the factors which will limit the design and function of the system. Chapter 3, Training Needs and Training Requirements, focuses on organizational and individual needs and overall and actual training requirements. The fourth chapter, Training System Design, discusses kinds of task emphasis, sequencing of training objectives, preparation of lesson plans, and design and preparation of materials. The concluding chapter, Training Quality Control, covers developmental testing, operational monitoring, knowledge and performance tests, test validity and reliability, development of tests, and evaluation of instruction. Various personnel training techniques and methods are appended. (EA)

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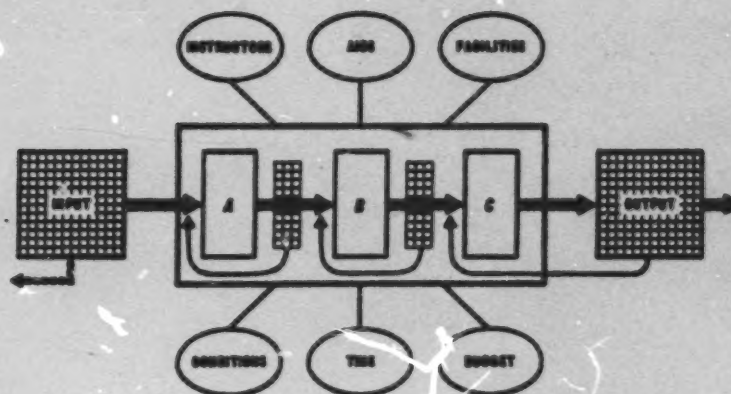
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# HumRRO

## HOW TO DESIGN TRAINING SYSTEMS

Harold L. Moon, Ronald E. Kraemer and William C. Osborn



HUMAN RESOURCES RESEARCH ORGANIZATION

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June 1973

Prepared for  
Staff Development and Training Unit  
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ED122101

CE007080

ED122101

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FR-D2-73-3

CEOC 7080



## FOREWORD

This report provides a procedural guide for developing personnel training programs. The system within which these procedures were derived was an integration of a training process outline provided by the Kentucky Department of Child Welfare and the systems approach to training model previously developed by HumRRO. The resultant system was implemented during a study designed to ascertain the job requirements and training needs of juvenile service unit workers. The results of that study are contained in a Kentucky Department of Child Welfare report, "Development of a Training Plan for DCW Juvenile Service Unit Workers," July 1973.

In developing this guide particular emphasis was placed on simplicity of presentation. It was assumed that the ultimate user will have had little previous experience in conducting training analyses. However, in print, such procedural statements are seldom as succinct, explicit, and straight forward as intended -- or why would we need universities. Thus, it is probable that during the initial use of this guide, inexperienced training personnel will require some level of assistance from training developers experienced in the systems approach to training analysis.

The work presented in this report was performed by HumRRO Division No. 2, Louisville, Kentucky, Dr. Donald F. Haggard, Director. It was performed under sponsorship of the Staff Development and Training Unit, Kentucky Department of Child Welfare (Contract No. S72-18) as a part of Contract No. 71A0004 with the Kentucky Crime Commission. Dr. Donald F. Haggard was the HumRRO Project Director. The project staff included Mr. William C. Osborn, Mr. Ronald E. Kraemer, and Mr. Harold L. Moon.

Appreciation is expressed for the considerable assistance given by the staff of the Staff Development and Training Unit, KDCW. The assistance, support, and cooperation of Ms. Rita McMahon, Chief, Office of Special Services and Ms. Lynn McCarthy, Training Administrator, was of particular value.



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HOW TO DESIGN TRAINING SYSTEMS

## CHAPTER I

### THE SYSTEMS APPROACH TO TRAINING

#### INTRODUCTION

We all know about systems as groups of things which function together for a purpose: irrigation systems, highway systems, the nervous system, and so on. Such terms have been current in western culture for centuries. We also know that many systems for achieving various purposes have evolved since the beginning of the industrial revolution. Most of these were combinations of existing machines and of persons and machines, often put together rather haphazardly. The systems approach, however, is significantly different, and it is a great and far-reaching development of our age. It is a process guided by a set of principles which emphasizes precise statement of objectives and specific design of the means of achieving the objectives. In other words, the systems approach is a method of organizing knowledge and human and other resources to achieve a specific purpose, and the resulting system usually is highly effective and efficient.

The systems approach has been developed to its highest art in the aerospace industry which, under direction of the National Aeronautics and Space Administration, landed men on the moon within a few years after that goal was announced by President Kennedy. As Fine (1) has asked, "If the systems approach can put men on the moon, why can't we use it to achieve other goals such as securing competent manpower for the human services field, a problem which is far more urgent for human welfare?" The answer is, "We can," and the purpose of this manual is to explain how.

## TRAINING SYSTEMS

Even before President Kennedy announced the objective of landing men on the moon, the Human Resources Research Organization (HumRRO) was applying the systems approach to design and develop training systems to provide manpower for complex man-machine systems, and the process is now widely used in business, industry, and government to achieve the most cost-effective training.

### A MODEL

Numerous models of training systems are in the literature (2,3,4,5), but most serve more to confuse than to make clear the essentials of a system. Therefore, although a relatively simple training system is, in its entirety, rather complex, a simplified model provided by Moon (6) is adequate for our purposes. This model shows the essential components of any training system, and it provides the basis for discussing the systems approach as a process, which consists of five major phases:

1. Definition of the Input, Output, and Subject Matter
2. Identification of the operating conditions and constraints
3. Design and production of the components
4. Evaluation and refinement of the system
5. Operational monitoring for quality control

Following are brief descriptions of the process and products of each phase.

#### Definition of the Input, Output, and Subject Matter

The INPUT of a training system is the untrained person. The OUTPUT is the trained person. SUBJECT MATTER is everything the trainees must learn. These are represented in Figure 1.





Figure 1\*

The INPUT is defined by stating the characteristics of the trainees, such as sex, age, basic skills, aptitudes, level of education, motivation, attitudes toward training and toward using what they learn, and knowledge of the subject matter. If this information is not readily available, it is obtained by testing and interviewing, or it is specified as the criteria for the selection of trainees.

The OUTPUT is defined by stating the training objectives -- precisely what the trainees must be able to do upon the completion of training, the levels of proficiency desired, and the conditions under which the trained behavior must be demonstrated. This information is obtained by task analysis, as described in Chapter 2.

#### Identification of the operating conditions and constraints

All systems operate within limits, and the design of all systems is constrained (limited) by available resources. Some of the important factors which limit training systems are shown in the ovals of Figure 2.

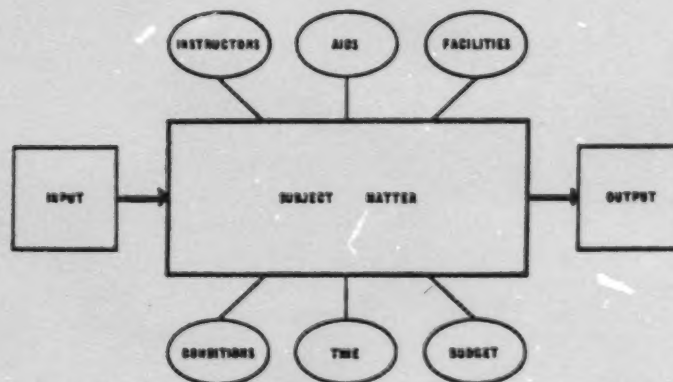


Figure 2

\* Figures 1,2,3,4, and 5, and most of the explanatory matter, are Copyright © 1964 by Harold L. Moon, Louisville, Kentucky (6). They are used here by permission.

Operating conditions are identified by seeking answers to questions such as these:

1. How much time is available for study each day?
2. Will study be:
  - at scattered geographic locations?
  - at a central location?
  - in a supervised group?
  - with instructors available?
  - at work stations?
  - at home?
  - on idle time between job tasks?
  - on released time?
  - on over-time?

Constraints on the design of the system are identified by seeking answers to questions such as these:

1. What training facilities are available?
2. What kinds and number of instructors are available?
3. What training aids are available?
4. What is the over-all training time limitation?
5. What are the administrative conditions?
6. What is the training budget?

#### Design and Production of the Components

A training system must receive the untrained persons (INPUT) and modify their behavior to match that specified in the training objectives (OUTPUT). This must be done under the operating conditions and within the constraints on design. Consequently, the system designer must consider operating conditions and constraints along with psychological facts and theories when designing the course and lesson components of the system. He must take all these factors into account when deciding:

1. Order of the subject matter within the total system, within courses, and within lessons.

2. Method(s) of instruction; e.g., lecture, laboratory, correspondence, programmed instruction, conference, seminar, demonstration, role playing.
3. Format(s); e.g., texts, workbooks, manuals, audio and/or visuals, instructor guides.
4. Training aids; e.g., audio and/or visual devices, job simulators, laboratory kits.

If an instructor is to function as part of the system he or she may be considered a component. Instructor components are "designed" by specifying precisely how they will behave in the system. These specifications can be used for the selection of instructors or as objectives for their production through trainer training.

Aids for completing this systems design process are given in Chapter 4.

When the system has been designed, the components are produced to specifications. In Figure 3, boxes "A", "B", and "C" represent lesson components. They could, of course, represent course components.

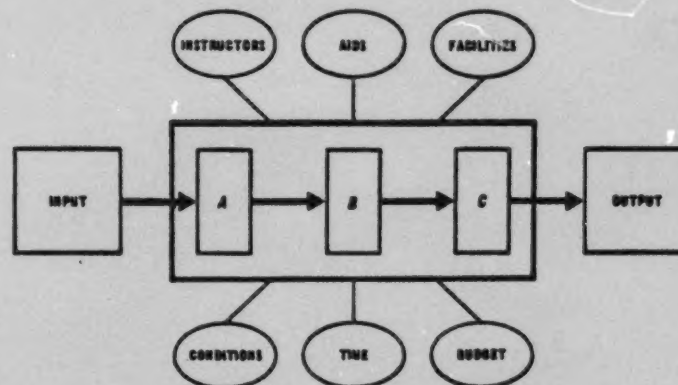


Figure 3.

Each lesson has its own INPUT and OUTPUT specifications and its own "blueprint" (by design) to guide production.

#### Evaluation and refinement of the system

To evaluate a system, three kinds of tests are prepared:

1. A prerequisite (trainee selection) test.

2. A diagnostic knowledge or performance test for each lesson.
3. A final performance test.

The prerequisite test is used during development of the system to assure that the trainees selected as developmental-test students have the critical input characteristics for which the system was designed. In Figure 4, this test is represented by the cross-hatching in the INPUT box. If a person does not pass this test, he is rejected, as indicated by the reverse arrow at the bottom of the box.

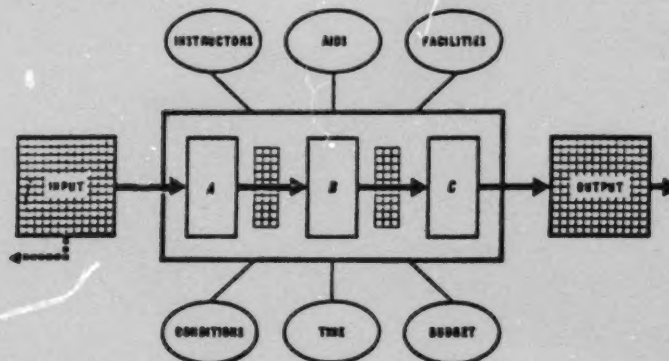


Figure 4.

The diagnostic tests, based on the objectives of each lesson, are used to evaluate the effectiveness of the lessons as they are developed. These tests are represented in Figure 4 by the cross-hatched areas between lesson components "A"- "B" and "B"- "C". If the tests show that developmental students do not achieve a lesson's objectives, the lesson is revised until it is effective. As Smith (7) noted, the systems approach has brought about a remarkable change in attitude toward instruction. No longer can an instructor or developer of instructional materials conscientiously say, "We taught the subject matter, but the student didn't learn!" If trainees do not attain



the system's objectives, the system is at fault, not the trainees, and the faults must be eliminated.

The final criterion test is based on the objectives (OUTPUT) of the complete system. Each section of this test is keyed to appropriate lessons so that if the developmental students do not achieve the over-all objectives, faults can be detected in the lessons which can be corrected by further revision. In Figure 4, the final test is represented by the cross-hatching in the OUTPUT box.

Aids for the development of knowledge and performance tests are given in Chapter 5.

#### Operational Monitoring for Quality Control

Quality control usually can be maintained economically in a training system by using the same tests employed in evaluating and refining the system, but in some cases it may be desirable to shorten the tests to reduce costs and facilitate administration.

If trainees fail to achieve the objectives at any point, they can be recycled, as shown in Figure 5 by the reverse arrows extending backward from the test blocks, or be given remedial instruction or practice before they proceed in the system or are placed on the job.

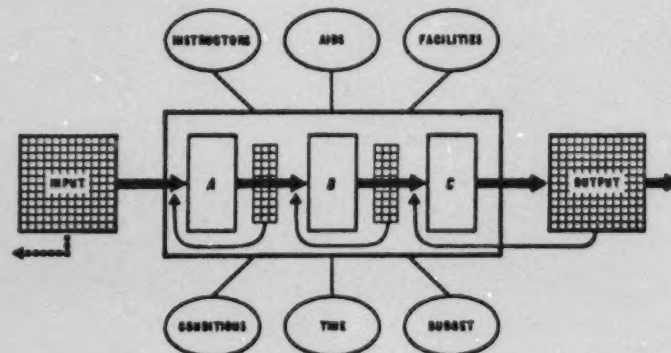


Figure 5.

These and other aspects of training quality control are discussed in detail in Chapter 5.

#### TYPES OF TRAINING SYSTEMS

The systems approach should be used in the design of all types of educational and training systems. Some of the types which may be useful in public service personnel programs are:

1. In-Service Training
2. Cooperative Education
3. Correspondence Instruction

#### IN-SERVICE TRAINING

In-service training for public service personnel is accomplished by either on-the-job training (OJT) or vestibule (formal) training.

#### On-the-Job Training

Because of its practicality, OJT is most often used. It can be either formal or informal. It is most informal when a new hire is "shown the job" by an experienced employee. It is most formal when the process is systems engineered and a qualified employee or employees serve as instructors. In both cases, the trainee and instructor work in the actual job situation, and both should follow the procedures of Job-Instruction Training, which is one of the training methods described in Appendix A.

To make OJT effective, the job-task analyst must "break down" each task into its procedural steps and stress those steps which will "make or break the job." As for all training, specific task performance standards to be attained by the trainee must be stated.

OJT has many advantages: the training occurs in the actual job situation and with the same equipment and materials used in job performance;

the trainees practice immediately what they learn and know immediately whether their performance is acceptable; the trainees partially pay for the cost of training by producing products (completed forms, records, etc.) or serving clients; trainees who learn at different rates can be more easily accommodated; and overall costs usually are lower than for other types of training.

OJT also has some disadvantages: unless the instructors are highly skilled, they may frustrate the trainees and cause them to be anxious because of unclear or impatient instructions; because of the one-to-one ratio, much time is consumed; production is reduced; reject rates usually increase; and learning of certain parts of tasks may be more efficient outside the job situation.

#### Vestibule Training

Vestibule (formal) training is the same as on-the-job training, except that the on-the-job situation is simulated outside the production area. Thus, the trainee is not required to produce as if he were "on-line" and, therefore, is not under such pressure. Also, the instructor's primary assignment is to train, not to both train and produce, and neither he nor the trainee is held accountable for costly errors. The cost of training is higher, but production or services are not interrupted, and in many well-designed vestibule systems the trainees attain job-task proficiency faster than in OJT. Disadvantages other than higher cost are: more trainees are required at a time to justify a vestibule system; training tasks and equipment must be kept the same as required on the job but not the actual job environmental conditions; therefore, trainees may not adapt as readily to the real job situation (production pressure, noise, hazards, supervisors); and trained behaviors may not transfer as well to the job, but this depends



greatly on how well actual job tasks and procedures are simulated in vestibule training.

#### COOPERATIVE EDUCATION

The term "cooperative education" usually refers to a system of training in which public and private vocational schools cooperate with employers to form a comprehensive training program. The trainees alternate between school classes and work assignments in operating organizations to gain actual work experience. Depending on needs, the alternation periods may be days, weeks, months or semesters, but time on the job usually equals or exceeds classroom time. In some instances, colleges or universities provide courses specifically designed to meet the "schooling" requirements for particular jobs, which may be most appropriate for some public-service trainees.

For the employer, the conditions and advantages and disadvantages of cooperative education are essentially the same as in on-the-job training, in that the trainees perform actual job tasks, and they require initial job-instruction training and coaching follow-up.

#### CORRESPONDENCE INSTRUCTION

The knowledge and basic skills required for many jobs can be learned through self-study of materials provided by numerous private "home study" schools and the extension services of colleges and universities. These extension services probably would be the best sources of courses for self-study. Unfortunately, the impression is prevalent that "self-study" refers exclusively to correspondence instruction. This is not so. Self-study is a basic method used in all teaching/learning situations, and its effectiveness is attested by the fact that most members of the National University



Extension Association<sup>1</sup> offer courses for both undergraduate and graduate credit, and some schools of higher education, such as New York University and Goddard College, base complete undergraduate degree programs primarily on self-study.

Many university extension courses are suitable for group study. When several trainees must study the same subjects, the study outlines provide flexible guides for progressive instruction. In many instances, personal visits with instructors or specialists can be arranged, as well as variations in study programs to meet specific training needs.

#### SUPERVISOR RESPONSIBILITIES

Regardless of the type or types of training systems which best suit the organization's needs, the line supervisors must be involved as much as possible in training systems analysis and administration of on-the-job training. The axiom, "Training is a line not a staff responsibility," simply means that line supervisors must see that their personnel are adequately trained to perform job tasks, even if the actual training is done by others. It also means that supervisors must be responsible for approval of the training objectives to assure that they specify essential job behaviors and job-entry standards, and they must be responsible for supporting (reinforcing) trained behavior on the job.

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<sup>1</sup> A "Guide to Independent Study Through Correspondence Instruction" is available for less than \$2.00 from the National University Extension Association, Suite 360, One Dupont Circle, Washington, D.C. 20036.

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CHAPTER 2  
TRAINING SYSTEMS ANALYSIS

INTRODUCTION

The procedures presented in this chapter are intended to guide analysts in deriving the necessary information for use in designing and developing a training system. Specifically, these procedures are for performing job-task analysis and for determining the factors which will limit the design and function of the system. As a process, these activities are called training systems analysis.

TASK ANALYSIS

To design and develop effective and efficient training systems, the designer and developer must first have the training objectives and subject matter.

Training objectives must be based directly on the tasks a worker must perform in doing his job. To be adequate, training objective statements must also include the task performance conditions and standards, and these will be discussed at the appropriate point in the analysis procedure. First, we must concentrate on identifying job tasks.

To adequately identify job tasks, the analyst must start with a job "expert" -- an experienced and capable job incumbent or a supervisor who also knows the job thoroughly. Some training officials try to reduce costs by assigning the task analysis to a job incumbent who was to analyze his own job behaviors and obtain an accurate product, but the results usually are deficient and more costly. There are two reasons: (a) analysts working alone usually leave out some tasks, because they do not remember them, or

they do not think they are important, or they themselves do not perform them, and (b) they are unable to accurately state some task procedures because they cannot recall, without assistance, precisely what they do when performing certain tasks. Experienced analysts often have encountered job "experts" who were unable to verbalize some tasks they perform easily (especially mental skills). In such instances, the analysts require the resource persons to perform the tasks while they observe and question until the exact procedure is determined and verbalized.

Even when an analyst works with a resource person, some tasks can be overlooked if the analyst is not dilligent in probing into all areas of job activity, and if the resource person does not perform some tasks performed by others having the same job title. These hazards can be avoided if analysts follow the procedures recommended below.

#### PROCEDURE

From this point onward we will assume that you, the reader, will be the systems analyst; this will make it easier for us to give direct instructions.

First, get an overview of the task analysis process by reading the ten steps, listed below, that you should follow:

1. Arrange for resource persons.
2. Prepare a complete list of job duties.
3. Prepare complete lists of tasks which comprise each duty.
4. Determine task importances and performance frequencies and standards.
5. Select tasks to be included in the training systems.



6. Analyze selected tasks into their behavioral (procedural or nonprocedural) components.
7. Determine the conditions under which the job behavior must be performed.
8. Determine for each task component the knowledge the trainees must learn to enable them to perform it.
9. State the training objectives.
10. Get the analysis results approved.

Second, get clearly and firmly in mind your purposes (ultimate objectives) in performing task analyses; they are to determine and state training objectives and subject matter. These statements will be the products of your task analyses, and they should appear as in the form shown in Figure 6.

Note in Figure 6 that each training objective has (indeed, must have) at least two or more subobjectives. Also note that each item (training objective, subobjective, and knowledge statement) has its own unique code. This makes it easy to refer to specific items during telephone or face-to-face conferences. The knowledge statements are boxed to make it easy for the reader to distinguish between them and the objectives.

Now that you have an overview of the task-analysis process, have in mind the products you are to obtain (training objectives and subject matter), and know the form in which the products should appear (Figure 6), proceed as directed below. Questions you may have probably will be answered as the analytical process unfolds.

Step 1. Arrange for resource persons.

The resource persons should be the best qualified and most experienced persons available. They can be job incumbents or immediate supervisors who are thoroughly familiar with all aspects of the job.



1. First training objective

1.1. First subobjective under (1.)

1.1.1. First knowledge statement under (1.1.)

1.1.2. Second knowledge statement under (1.1.)

.

1.1.9. Ninth knowledge statement under (1.1.)

1.2. Second subobjective under (1.)

1.2.1. First knowledge statement under (1.2.)

1.2.2. Second knowledge statement under (1.2.)

.

1.2.7. Seventh knowledge statement under (1.2.)

2. Second training objective

2.1. First subobjective under (2.)

2.1.1. First knowledge statement under (2.1.)

2.1.2. Second knowledge statement under (2.1.)

2.2. Second subobjective under (2.)

2.2.1. First knowledge statement under (2.2.)

2.3. Third subobjective under (2.)

2.3.1. First knowledge statement under (2.3.)

2.3.2. Second knowledge statement under (2.3.)

2.3.3. Third knowledge statement under (2.3.)

First work with only one person when preparing the statements of job duties and tasks (Steps 2 and 3) and detailed analyses of tasks (Steps 6, 7, and 8). To be sure you have identified all job duties and tasks, work with at least two additional resource persons in Steps 2 and 3, and again in Steps 6, 7, and 8, to be sure that the task procedures, performance conditions, and required knowledges are complete and accurate. You will also need assistance from other persons, as noted in Steps 4, 5, and 11.

Step 2. Prepare a complete list of job duties.

Starting here with duties, put each duty, task, and knowledge statement, with its code, on a separate slip of paper. A good size is obtained when 8 1/2" x 11" pages are cut into eight pieces of 2 3/4" x 4 1/4". Since a complete analysis will yield hundreds of statements, cards become too bulky and costly.

The purposes of all jobs are accomplished by the completion of duties, which are major groupings of job activities. Depending on the orientation of the resource persons some may be able to state their duties as such, whereas others respond adequately only when asked about their major job responsibilities. To be thorough, both types of questions should be asked when they seem most appropriate: "What are your job duties?" and "What are your major job responsibilities?"

To be sure that you probe all areas of job responsibility, ask job incumbents questions such as these:

1. What else does your supervisor require you to do?
2. Do you work with other persons in the organization?  
What do you do with each of them?
3. Do you supervise others? What do you have them do?  
What do you do for them and in relation to them?

4. Do you contact anyone in other departments of your organization? For what purpose?
5. Do you contact anyone outside your organization? For what purpose?
6. Does anyone in other departments of your organization contact you? For what purpose?
7. Does anyone outside your organization contact you? For what purpose?
8. Do you work with anyone outside your department or organization? What do you do with them?
9. Do you seek information of any kind? From whom? What for?
10. Do you make reports or otherwise give information to anyone in or outside your organization? What do you report?
11. Do you receive reports or information from anyone in or outside your organization? What do you do with the information?

This kind of probing probably will push the analysis into Step 3, because some of the answers may relate to tasks which are parts of duties already stated, and you must ask the resource person if this is so. Conversely, you may find when determining duty tasks in Step 3 that one or more task clusters belong to duties not uncovered in Step 2.

If you are analyzing a job in the child welfare area, the duties you finally determine may be similar to this list:<sup>1</sup>

1. Opens case
2. Conducts child abuse investigation
3. Conducts child neglect investigation
4. Provides continued DCW services
5. Obtains voluntary commitment of child to DCW

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<sup>1</sup> These duty statements and task statements elsewhere in this chapter were taken from duty and task inventories prepared by HumRRO for the Kentucky Department of Child Welfare.

6. Obtains court commitment of child to DCW
7. Obtains voluntary termination of parental rights
8. Obtains involuntary termination of parental rights
9. Obtains release of child from voluntary commitment
10. Obtains release of child from Juvenile Court commitment
11. Obtains release of child from commitment following Circuit Court action
12. Transfers case within department
13. Closes case

Step 3. Prepare complete lists of tasks which comprise each duty.

Taking the duties one at a time, ask the resource person what he does to perform the duty. Note: Ask what he does, not how he does it. If you ask how, you probably will get subtask information which you do not want at this point.

To get complete task information, you must also ask, "What would cause you to perform this duty?" As in Duty 1 (above), Opens case, the answer might be, "We get a request to help a child." You would ask, "What kind of help?" and "Why might help be needed?" You would then translate the answers into an appropriate statement of what the job incumbent does: "Receives request for protective services to child considered dependent, neglected, abandoned, abused or with behavior problems."

To proceed with the analysis of Duty 1, ask, "What do you do next?" until all tasks are stated.

Below is a complete list of tasks which comprise job Duty 1:



1. Opens case

- 1.1. Receives request for protective services to child (etc., as stated above)
- 1.2. Checks files to determine whether there is a current or previous record
- 1.3. Adds case to case list
- 1.4. Prepares and distributes Notice to Central Office, form DCW-121
- 1.5. Prepares and distributes Face Sheet I and II, form DCW-183

(NOTE: because the codings of duties and tasks at this point are the same as the codings of training objectives and subobjectives in Figure 6, you may have the idea that duties and tasks are the same as training objectives and subobjectives. This is not so. As you will see later, however, training objectives and subobjectives do represent duties and tasks in highly fractionated form.)

When you have determined all the duties and tasks available from the first resource person, you should check them for completeness with at least two other qualified and experienced job incumbents or their immediate supervisors.

Step 4. Determine task importances and performance frequencies and standards.

When satisfied that the duty and task lists are complete, include them in a questionnaire designed to determine for each task its:

1. Importance in job performance
2. Frequency of performance
3. Job-entry standard of performance

Immediate supervisors of job incumbents are best qualified to rate the tasks on each of those factors. Supervisors can further aid in identifying tasks to be included either in formal or on-the-job training

(OJT) by giving their opinion about whether each task requires training or which type of training is adequate.

Task importance should be rated on a five point scale, such as shown below:

1. Very important
2. Rather important
3. Slightly important
4. Rather unimportant
5. Very unimportant

Each task should be rated according to how important it is in performance of the job. That is, if performance of a task is critical to adequate job performance it should be rated "very important." If it doesn't matter much whether a task is performed, it should be rated "rather unimportant" or "very unimportant," depending upon the supervisor's judgment.

Frequency of task performance on the job should also be indicated on a five point scale, such as:

1. Very often (daily)
2. Often (weekly)
3. Rather often (monthly)
4. Not often (quarterly)
5. Seldom (semi-annually or less)

Table 1 is a suggested questionnaire format for obtaining supervisor information as to task importance, performance frequencies, and training requirements.

Job-entry standards of task performance must be stated by the supervisors. Adequate statement of a performance standard may include: (a) quantity of the task product; (b) quality of the product; and (c) the time limitation in which the quantity and quality must be produced by a

TABLE 1

## SUGGESTED TASK QUESTIONNAIRE FORMAT

| IMPORTANCE            | FREQUENCY                | TRAINING NEEDED?                                                    | OJT                                                                | IN-SERVICE                                                                              |
|-----------------------|--------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1. Very important     | 1. Daily                 | Can most new employees perform this activity upon entering the job? | Can most new employees learn this activity in on-the-job training? | Do most new employees require formal in-service type training to perform this activity? |
| 2. Rather important   | 2. Weekly                |                                                                     |                                                                    |                                                                                         |
| 3. Slightly important | 3. Monthly               |                                                                     |                                                                    |                                                                                         |
| 4. Rather unimportant | 4. Quarterly             |                                                                     |                                                                    |                                                                                         |
| 5. Very unimportant   | 5. Semi-annually or less |                                                                     |                                                                    |                                                                                         |

DUTY: 1. OPENS CASE

Tasks:

1.1. Receives request for protective services to child considered dependent, neglected, abandoned, abused, or children with behavior problems.

1.2. Checks files to determine whether there is a current or previous record.

1.3. Adds case to case list.

1.4. Prepares and distributes Notice to Central Office, form DCW-121.

1.5. Prepares and distributes Face Sheet I & II, form DCW-183.



person entering the job the first time. For example: for job entry, the person must be able to complete a (one-quantity) form DCW-121 accurately (quality) within 10 minutes (time).

Performance-standard statements will not be necessary for many types of tasks, and one or two components of a complete standard may be omitted. Such decisions must be made by the supervisors. After all, performance standards are statements of what job-entry proficiencies are acceptable to the supervisors.

The criteria for specifying performance standards will vary with the organization, but they should be considerations of the effect of job performance on factors such as these:

1. Safety of workers and equipment
2. Amount of production or services
3. Costs of production or services
4. Client relationships
5. Organizational reputation
6. Worker peers
7. Degree of supervision required

Performance standards should be agreed upon by supervisors working as a committee after they have individually or as a group indicated task importances and performance frequencies, and the type of training (OJT or formal) the tasks require. At the same time, they should also approve the tasks as a complete description of the job.

The supervisors should consider job-entry performance standards for only those tasks they say should be learned in formal training. They may, however, want to specify performance standards for some OJT tasks which



the trainees must attain before they are allowed to work alone. Such standards, of course, would be stated as part of the OJT objectives.

If the supervisors disagree somewhat in their task importance and performance-frequency data, average these data for each task to find the consensus values. If they widely disagree on these data or on their answers to questions about training requirements, they should be asked to confer on the data and reach a consensus on each task.

How to use task-importance and performance-frequency data is discussed in Chapters 3 and 4.

Step 5. Select tasks to be included in the training systems

Having the supervisor questionnaire data, selection of tasks for inclusion in OJT and formal training systems is simply a matter of identifying those which belong in each category.

Step 6. Analyze the selected tasks into their behavioral (procedural or nonprocedural) components.

Up to now you will have determined in job tasks what the job incumbents do. Now you must determine precisely how they perform each task selected for training.

Actually, this step and Steps 7 and 8 should most often be performed simultaneously, but they are separated in this description of the procedures to avoid possible confusion.

It is highly important at this point to keep clearly in mind that the ultimate goals of task analysis are to determine training objectives and subject matter. (Training objectives are defined in Step 9, and subject matter is defined in Step 8).

Although you start this step by dealing with task statements and breaking them down into their behavioral components, you will find in most

instances that the task statements will disappear, as such, as the behavior is fractionated to a level appropriate for training objectives. This disturbs some beginning analysts, but it should not, if the goals of the process (training objectives and subject matter) and the process itself are understood.

In working with the same resource persons who helped you state duties and tasks, begin by explaining the goals (training objectives and subject matter), then show them each task statement and ask them to explain how they perform the activity. Do not call it a task. This will help both you and the resource persons to concentrate on the processes of job performance.

Write each step of the job-performance process on a separate slip of paper. Start with the task statement, and assign it the code (1.). The steps or bits of behavior which make up that activity are subordinate to it, so each behavioral statement under (1.) should be coded (1.1.), (1.2.), (1.3.), etc.

At this point, we must emphasize that there can be only two levels of behavior -- at the training-objective level, (1.), (2.), etc., and the subobjective level, (1.1.), (1.2.), (1.3.), etc. If, as analysis proceeds, you find that behavioral statements are being coded (1.1.1.), (1.1.2.), (1.1.3.), etc., this is the knowledge level, and only knowledge statements can have such codes. (Look again at Figure 6.). When behavioral statements are being given knowledge-statement codes, the behavioral statements must be recoded until no statement of behavior is below the subobjective level. Now we shall demonstrate how this is done.

Suppose the activity (task) statement is, "Conducts interview with parent suspected of child neglect." To keep everything in order, note

the duty statement; it is "Conducts child neglect investigation." Since this is too gross to stand as a training objective, make it a topical statement by writing on a slip of paper: CHILD NEGLECT INVESTIGATION.

Now assign code (1.) to the activity statement and write it and its code on a separate slip of paper, but leave the "s" off "conducts."<sup>2</sup>  
Now you have:

#### CHILD NEGLECT INVESTIGATION

1. Conduct interview with parent suspected of child neglect.

Proceed to analyze this activity by asking how it is done.

When resource persons are asked how they conduct interviews, they may say,<sup>3</sup> "First, I ask the person who answers the door if he or she is so-and-so, and then I identify myself and ask if I may come in."

You should say, "In other words, you identify the parent and yourself and gain entry to the residence."

"Yes."

Then you write on separate slips of paper: 1.1. Identify parent;  
1.2. Identify self to parent; 1.3. Gain entry to the residence.

This gives you:

#### CHILD NEGLECT INVESTIGATION

1. Conduct interview with parent suspected of child neglect.
  - 1.1. Identify parent.
  - 1.2. Identify self to parent.
  - 1.3. Gain entry to the residence.

---

<sup>2</sup> You are now writing ability statements as bases for training objectives, with "The trainees must be able to ----" understood.

<sup>3</sup> Since we do not know the actual interviewing procedure, the task-component statements are fictional.



Now you must probe. About (1.1.) ask, "Is just getting the person's name enough for parent identification?"

"Oh, no. We must have positive identification -- a driver's license or a card with his or her name and picture."

"Is only one positive identifier enough?"

"If it's a name-photo card which matches the persons name and appearance, that's all right; but if its only a driver's license, we can't be sure."

"Why?"

"Well, the person could have the parent's driver's license but still not be the parent."

"What do you do then?"

"We usually ask for a signed affidavit."

"Why do that?"

"Well, if the person is an imposter, he or she usually admits not being the parent rather than sign a false affidavit that can cause trouble."

"Do you explain that possibility?"

"Always."

"What do you do if a person refuses to sign an affidavit?"

"Report to my supervisor."

"And if the person agrees to sign it?"

"I fill it out, get it signed, and proceed with the interview."

"When do you ask for positive parent identification? Before you gain entry or afterward?"

"Usually afterward, if they are cooperative."

"Are many uncooperative?"

"Some are, because they are afraid and remain up-tight no matter how hard we try to be pleasant -- nonthreatening."



"In other words, you try to put them at ease -- establish rapport?"

"Yes. Otherwise, interviewing is too difficult and unpleasant."

"Let's talk about that later. First we should get some of this down."

Write "Establish rapport" on a slip of paper as a reminder to include it later as a subobjective, then state and code what you have learned, as follows:

Since the hypothetical conversation pertained to (1.1.) "Identify parent," and since the resource person revealed that identification must be positive and that it usually occurs after residence entry is gained, you should first do four things:

1. Change the statement from "Identify parent" to "Positively identify parent."
2. Change the code from (1.1.) to (1.3.)
3. Change the code of "Gain entry to residence" from (1.3.) to (1.2.)
4. Change the code of "identify self to parent" from (1.2.) to (1.1.)

You now have this product:

#### CHILD NEGLECT INVESTIGATION

1. Conduct interview with parent suspected of child neglect.
  - 1.1. Identify self to parent.
  - 1.2. Gain entry to residence.
  - 1.3. Positively identify parent.

Since "Positively identify parent" is now coded (1.3.), pertinent information must be coded (1.3.1.), (1.3.2.), (1.3.3.), etc. Concentrate first on behaviors and proceed. From the information already received from

the resource person the results should be:

- 1.3.1. Ask parent for positive identification.
- 1.3.2. If positive identification is unavailable, request person to sign an affidavit to attest identity.
- 1.3.3. Explain to person that prosecution can result from a false affidavit.

STOP! You already have three behavioral statements coded as knowledge statements, which is not acceptable. The only way to correct this situation is to move the statements up one level. This means that everything else you have coded to this point must also be moved up one level. Since the activity (modified task) statement (1.) is already at the highest code level, all you can do is make it a sub-topic statement, "CONDUCT OF PARENT INTERVIEW," which removes it as a training objective. Now the subobjectives (1.1., 1.2., and 1.3.) must become training objectives (1., 2., and 3.), and the behavioral statements you have coded (1.3.1., 1.3.2., and 1.3.3.) must become subobjectives (3.1., 3.2., and 3.3.). These adjustments, and addition of other pertinent information, give you this product:

#### CHILD NEGLECT INVESTIGATION

##### CONDUCT OF PARENT INTERVIEW

1. Identify self to parent.
2. Gain entry to residence.
3. Positively identify parent.
  - 3.1. Ask parent for positive identification.
  - 3.2. If positive identification is unavailable, request person to sign an affidavit to attest identity.
  - 3.3. Explain to person that prosecution can result from a false affidavit.

3.4. If person refuses to sign an affidavit, report to your supervisor.

3.5. If person agrees to sign affidavit, prepare it and get it signed.

3.6. When affidavit is signed, proceed with interview.

Hopefully, this brief hypothetical analysis adequately demonstrates the processes of getting started, probing, and adjusting the status and coding of behavioral statements to fit into the analysis model. The adjustment of statement status and codes is not just an arbitrary requirement. Much experience has demonstrated that the process greatly increases the power of analysis, which enables you to ferrit out all aspects of job behavior and required knowledges. Moreover, since the form makes the behavior and knowledges explicit and in their proper relationships, the results permit systems designers and developers to proceed efficiently and with confidence that nothing important has been overlooked.

A final admonition for this step: be not concerned about getting too much behavioral detail; rather be concerned about possibly not getting enough.

Step 7. Determine the conditions under which the job behavior must be performed.

To determine the conditions under which job behavior must be performed, ask questions such as these: When performing this activity,

1. With whom do you work?
2. Where do you work?
3. What machines do you use?
4. What equipment do you use?
5. How much space do you have?
6. Is the environment quiet? noisy? hot? cold?
7. Are you often interrupted by the telephone, persons, other job demands?
8. Must you work under time pressure?



Such questions suggest themselves and should be asked during Step 6, or they can be asked later. Regardless of when conditions become known, they should be included as part of the statements that will become training objectives, as in this hypothetical example: "In company with a police officer, gain entrance to residence." (Hopefully, we are not being facetious.) "In company with a police officer" is a statement of a condition.

Step 8. Determine for each job behavior the knowledge the trainees must learn.

Job knowledge requirement include everything the trainees must know to enable them to perform job tasks. Some of these requirements are the basic things trainees must know before they enter the training system. These usually are called prerequisites and should be stated precisely as part of the trainee characteristics which describe untrained persons as the input to a training system. We are concerned in this step, however, with the knowledge trainees must learn as a part of the training system's subject matter.

Subject matter is everything the trainees must learn, and there are two kinds. One kind is procedural; that is, if the subobjectives of a training objective are steps which must be performed as a procedure, the procedure is subject matter, because the trainees must learn it to enable them to perform a task or to prepare them to practice for the development of a skill; the other kind is the general and specific knowledge the trainees must have to support trained behavior. This kind of subject matter consists of facts, concepts, principles, and precautions the trainees must learn so they can understand when and why they must perform the behavior and know how to perform it adequately and safely.

If training systems are to be effective, the subject matter must include everything necessary to meet job requirements; in other words,



nothing essential should be left out. If, however, training systems are to be efficient the subject matter should contain nothing that is unnecessary. Therefore, general statements of knowledge requirements must be avoided, and this is done by obtaining specific knowledge requirements from the resource persons, which you must transform into knowledge statements.

For example, recall subobjective (3.1.): "Ask parent for positive identification." Also recall that in the hypothetical conversation with the resource person, he or she said they ask the parent for a driver's license or a name-photo card. If the photo on the card matches the appearance of the person, it is considered adequate positive identification. However, if there is only a driver's license without a photo, the resource person implied that something else is needed. So you must now ask what else is required to constitute adequate identification. The resource person may answer, "We ask for a birth certificate or a marriage license. If the person is an imposter, he will not likely be able to produce either one." You should also ask the resource person to state all documents or means by which positive identification may be established. When you have an exhaustive list, you are ready to state subject matter under subobjective (3.1.). Also, in the hypothetical conversation with the resource person, we obtained some information which should be included under (3.2.) and (3.3.). So the product of analysis at this point should be:

#### CHILD NEGLECT INVESTIGATION

##### CONDUCT OF PARENT INTERVIEW

1. Identify self to parent.
2. Gain entry to residence.
3. Positively identify parent.

3.1. Ask parent for positive identification.

3.1.1. A name-photo card is the best means of positive identification, because you can see if the person's name is on the card and whether the photo matches the person's appearance.

3.1.2. Other means of identification are a driver's license, birth certificate, marriage license, etc. (other specific means).

3.1.3. If a name-photo card is unavailable, at least two other documents are required to establish adequate identification. For example, if the person has only a driver's license you cannot be sure he is not an imposter. If, however, the person can produce a birth certificate or a marriage license, it is unlikely that he or she would be able to produce either of those documents in addition to a driver's license, unless he is the person you are to interview.

3.2. If positive identification is unavailable, request the person to sign an affidavit to attest identity.

3.2.1. The main reason for asking for a signed affidavit is to determine the person's willingness to sign it. If the person is unwilling to sign, he or she may be an imposter.

3.3. Explain to the person that prosecution can result from a false affidavit.

3.3.1. An affidavit is a legal instrument, and if a person signs a false affidavit he is liable to prosecution for perjury.

3.3.2. WARNING: You must be careful to avoid doing more than telling the person that he is liable to prosecution if he signs a false affidavit, because you yourself may be in danger of being charged with giving legal advice without a license.

3.4. If the person refuses to sign an affidavit, report to your supervisor.

3.5. If the person agrees to sign an affidavit, prepare it and get it signed.

3.6. When the affidavit is signed, proceed with interview.

The product now shows that you have knowledge statements for only three subobjectives. Obviously, you must proceed as demonstrated to get all

relevant knowledge statements for the other subobjectives, if they are appropriate; some subobjectives may not require knowledge statements.

Note that (3.3.2.) is a warning for the trainee. This is one kind of precaution. There are three: CAUTION, WARNING, and NOTE.

CAUTION indicates a precaution that is necessary to prevent damage to equipment.

WARNING is a precaution to prevent injury to personnel.

NOTE is a precaution that is necessary to avoid an error in performance.

To be sure that the subject matter is complete but not more than is necessary, you must determine everything of importance that the trainees must learn, including all precautionary items; precautionary items are easily overlooked.

#### Step 9. State the training objectives.

When you complete the preceding steps you will have all the information necessary for stating training objectives.

There are three elements which make up training objectives: the required behavior; the conditions under which the behavior must be performed; and the standards of behavior performance.

Some training objectives consist of all three elements. Others consist of only the behavior and the conditions under which it must be performed. As demonstrated in Step 7, you will have already stated the behavior and conditions for some tasks. If performance standards specified by the supervisors do not apply to these training objectives, then they are already complete.

Formal training objectives are of two kinds: (a) task-performance objectives and (b) knowledge attainment objectives.



Task-performance training objectives specify what the trainees must be able to do when they are first assigned to the job and when appropriate the performance conditions and standards.

Knowledge-attainment training objectives specify what the trainees must be able to do to demonstrate that they have acquired necessary subject matter, both procedural and conceptual, and the performance conditions and standards, when appropriate.

Since certain knowledges are necessary to either make trainees able to practice task behaviors or to otherwise adequately perform job tasks, knowledge attainment objectives are sometimes called enabling objectives. Subobjectives of training objectives, whether procedural (subject matter) or nonprocedural, also are sometimes called enabling objectives, because the trainee must be able to perform them in order to attain task-performance training objectives. We use the term enabling objectives in Chapter 4 to denote the kinds of objectives mentioned.

On-the-job training objectives are essentially the same as task-performance training objectives, except that the performance standards designate the performance proficiency the trainees must attain before they will be allowed to work alone on the job.

In examples of the three types of training objectives stated below, the training-objective elements are indicated in parentheses (behavior, conditions, and performance standards).

#### Formal Training Job-Performance Objectives

1. While alone and in privacy (conditions), obtain all pertinent case information within thirty minutes (standard) by interviewing (behavior) child alleged to be neglected.

2. Accurately (standard) report information about child neglect case (behavior) as witness in court hearing (condition).

NOTE: In a statement such as this, the term "accurately" is unnecessary, but such a standard is always understood.

3. Inform parent or guardian that DCW services will be continued (behavior).

NOTE: In a statement such as this accuracy as a standard is understood; a conditions statement is unnecessary unless the means of informing must be specified such as "in person at parent's residence" or "by telephone."

4. Given a standard mechanical typewriter (condition), complete form DCW-150 (behavior) within 10 minutes (standard).

NOTE: In a statement such as this the standard of accuracy is implied; however, it may be specified if workers have a history of completing forms inaccurately.

#### Formal Training Knowledge-Attainment Objectives

1. Given paper and pencil (conditions), state the procedure for obtaining a court order to proceed with child neglect investigation (behavior).

NOTE: The standard of accuracy is understood.

2. Given a list of relevant and irrelevant home environment conditions pertaining to alleged child neglect (conditions) check (behavior) all which are relevant (standard).

NOTE: If the supervisors specify that the trainees must be able to identify all relevant home environment conditions upon entering the job, the standards must be stated as all. If, however, the supervisors specify that trainees must be able to identify 80% of the relevant conditions, the training objective should be stated as shown in statement three below.

3. Given a list of ten relevant home environment conditions pertaining to alleged child neglect and at least five irrelevant conditions (condition) check (behavior) no less than eight (80%) of the relevant conditions (standard).
4. Given five columns of five two-digit numbers (condition), add (behavior) at least four columns accurately (standard) without the aid of an adding machine (condition).

NOTE: The requirement to add columns of five two-digit numbers should be based on an actual job requirement. In other words, this type of training objective should specify exactly what the trainees must be able to do on the job. If they must add columns of three-digit numbers this should be specified, and so on.

When you have precisely stated all training objectives, you will have specified not only the job performance requirements the trainees must obtain but you have provided the bases for knowledge and performance tests; that is, you will have written prescriptions for the design of test items. Tests are discussed in Chapter 5.

#### On-the-Job Training Objectives

1. Without assistance during an unannounced visit to a home where suspected child neglect has been reported (conditions) record in writing (behavior) all (standard) pertinent environmental factors.

NOTE: "All pertinent environmental conditions" is a vague standard if it is to stand as stated. However, the subobjectives and the knowledge statements should constitute precise specifications of all pertinent environmental conditions. This kind of problem is discussed in Chapter 5 in relation to test development.

2. While working alone (condition), file petition (behavior) in office of circuit court clerk (condition).

NOTE: It seems unnecessary to include a standard statement.



3. Make closing entry on case list (behavior).

NOTE: The conditions: "given a case list and a closing statement" could be stated, but they are clearly understood. The standard of accuracy is also understood.

Step 10. Get the analysis results approved.

When your task analysis is complete it should be typed in the form shown in Figure 6. It is then ready for final review by a committee of supervisors or, if for some reason supervisors are not available, qualified job incumbents.

Each supervisor or supervisor substitute should review the entire product to find answers to these questions:

1. Do the training objectives define all necessary job behaviors?
2. Are the performance conditions accurate?
3. Are the performance standards accurate?
4. Do the subobjectives state precisely how the worker must perform job tasks?
5. Are the required knowledges the trainee must learn complete and accurate?
6. Is any unnecessary knowledge specified?

If the supervisors disagree on any of these points they should reach a consensus. This consensus will, in effect, standardize the job and training requirements. This means that all trained workers in the job will have the same knowledge and will perform their tasks in the same way.

CONSTRAINTS ON SYSTEM DESIGN

There are three kinds of constraints on system design: (a) the conditions under which job tasks must be performed, (b) the limitations imposed upon operation of the training systems, and (c) limitations on

development of the systems.

#### TASK-PERFORMANCE CONDITIONS

The task-performance conditions you stated in the training objectives are of basic importance to systems designer. To make formal training as realistic as possible, the designers must know these conditions to decide which ones should be provided or simulated in the training system.

#### LIMITATIONS ON OPERATION OF THE SYSTEM

Limitations on operation of a training system are the conditions under which it must be administered. As noted in Chapter 1 under Operating Conditions and Constraints on system design, you must now be concerned with things such as trainee study time and location and availabilities of various resources, including training personnel. Typical questions to be answered are given in Chapter 1.

Suppose, for example, that trainees must study materials in the job situation. The conditions under which trainees must study are critical to the design of such materials. Suppose also that a workbook must be prepared, but the trainees will have only a small space in which to deal with it. The designer should know this condition and be careful to limit the size of the book so it can be handled with ease within the limited study space. You must be sure, therefore, that all pertinent conditions under which the system must operate are made explicit. Whether you state these conditions as marginal notations on the statements of training objectives or provide them separately must be left to your discretion or a decision by the designer.

#### LIMITATIONS ON DEVELOPMENT OF SYSTEMS

Both the design and development of a training system are limited by

such constraints as development time, money, and personnel limitations. If a system must be in operation within six months, a system design that would require longer to develop would not be feasible, and if only \$20,000 is available for development, the design must not specify a more costly system.

#### SUMMARY

When you have completed your task analyses, stated the training objectives, and determined all constraints on the design and development of the system or systems, you will have completed your training systems analysis.



## CHAPTER 3

### TRAINING NEEDS AND TRAINING REQUIREMENTS

Some writers represent training needs and training requirements as the same things. Sometimes they are, but not always, and one needs to know when and how they differ if he is to design an effective and efficient training system.

As a basis for meaningful discussion, let us begin with definitions of terms.

Training needs are of two kinds -- organizational and individual. Training requirements are also of two kinds -- overall and actual.

Organizational training needs are the job-related personnel abilities that an organization can gain through training.

Individual training needs are the job-related knowledges and skills each trainee must acquire during training to meet organizational training needs.

Overall training requirements are what a training system must accomplish, in terms of job-related human abilities, to assure that organizational training needs are met as well as the time and money allotted for training will permit.

Actual training requirements are those portions of overall training requirements that are necessary to meet individual training needs.

The full meaning of these terms should become clear in the following discussions.

## ORGANIZATIONAL TRAINING NEEDS

If the process of job-task analysis described in Chapter 2 is followed, the supervisors or their substitutes will have determined the personnel abilities the organization can gain through training (its training needs) when they have specified the task-performance standards and approved the training objectives.

It is important to note that although supervisors also will have indicated task importances and performance frequencies, neither is directly related to organizational training needs. The needs are stated in the training objectives, which specify only what graduated trainees must be able to do when the tasks are required, regardless of whether they will be performed soon or late or frequently or infrequently after job entry. Task importances and performance frequencies, although not directly related to organizational training needs, are essential for determining overall training requirements which are directly related to training needs, as you shall soon see.

## OVERALL TRAINING REQUIREMENTS

Overall training requirements, being what a training system must accomplish, are the same as the organizational training needs -- the training objectives -- if all tasks indicated for training are included in the training system and if the task performance standards to be attained during training are the same as specified in the training objectives.

Overall training requirements differ from organizational training needs when either the tasks included in training are fewer than the tasks (objectives) stated as training needs, or any of the task-performance

standards to be attained during training differ from the standards stated in the training objectives.

"Hold on!" you may say, "Training objectives are training objectives; they are approved by the supervisors; how can you leave any out and meet the organization's training needs? and why would you want to change any of the performance standards?" Good questions. We shall answer the first immediately and deal with the second a bit later.

Recall that in the definition of overall training requirements we said that they are what a training system must accomplish to assure that organizational training needs are met as well as the time and money allotted for training will permit.

In the best of all possible worlds, as hoped for by training personnel, training time and funds would be unlimited so that all organizational training needs could be met; but, alas, we on this great planet earth are seldom so favored. When restricted, we may have to select among the training objectives (tasks) as wisely as we can.

To select tasks wisely (and also to determine whether performance standards should be changed) we must identify the most critical tasks. Fortunately, we have a way to determine relative task criticalities - by relating task importances and the strictness of their performance standards.

Strictness of performance standards can be judged by relating the amount of work to be done to the performance time limitation. The accuracy standard can be ignored, because for most job tasks high degrees of accuracy are required. Here are definitions of strictness which can be used as guidelines:

Very Strict -- large amount of work in a relatively short time.

Strict -- a large amount of work in a moderately short time or a moderate amount of work in a very short time.

Moderately

Strict -- a moderate amount of work in a moderately short time.

Rather

Strict -- a complex or lengthy procedure with no time standard specified.

Not Strict -- a short or non-complex procedure with no time time standard specified.

To get indications of relative task criticalities, the strictness of task standards are related to task importances, as shown in Table 2.

TABLE 2  
JOB-TASK CRITICALITIES

| STRICTNESS OF<br>TASK PERFORMANCE<br>STANDARD | TASK IMPORTANCE         |                        |                        |
|-----------------------------------------------|-------------------------|------------------------|------------------------|
|                                               | Very<br>Important       | Rather<br>Important    | Slightly<br>Important  |
| Very strict                                   | Very highly<br>critical | Highly critical        | Critical               |
| Strict                                        | Highly critical         | Critical               | Moderately<br>critical |
| Moderately strict                             | Critical                | Moderately<br>critical | Rather critical        |
| Rather strict                                 | Moderately<br>critical  | Rather critical        | Slightly<br>critical   |
| Not strict                                    | Rather critical         | Slightly<br>critical   | Not critical           |

Note in Table 2 that only the designations of very important, rather important, and slightly important are included, because rather unimportant and very unimportant tasks should not be considered critical.



If all tasks cannot be included in the training system, then selections can be made on the basis of task criticalities, with the most critical being selected first and the least critical last, until all that can be accommodated have been chosen.

Even if all tasks are included in training, task criticalities should be considered to determine whether special attention should be given to tasks.

By special attention we mean the kinds of things the system designer might consider, in addition to the training necessary to meet job-entry standards of performance specified for non-critical tasks, to assure that critical tasks can be performed as specified when they are required on the job.

Whether a critical task should receive special attention depends on the degree of its criticality and its frequency of performance on the job. Even very highly critical tasks, if performed daily or weekly, do not require special attention, because if trainees meet the job-entry performance standards during training, they should be able to perform adequately on the job. If, however, a task is performed only monthly, or quarterly, or semi-annually or less, a need for special attention may be indicated, because all learning deteriorates if what is learned is not practiced regularly. Something, then, should be done to assure that certain critical tasks can be performed adequately when delayed or infrequent performance is required.

There are three ways to assure adequate performance of delayed critical tasks: (a) increase the performance standards to be attained during training so that the job-entry standards can be met when the tasks are required; (b) provide refresher training just before the tasks are required; and (c) provide

task-performance (job) aids. Guidelines for deciding which of these should be done are given in relation to training system design in Chapter 4.

Since refresher training usually is done on the job, and since task-performance aids usually do not modify formal training requirements, only an increase in task-performance standards to be attained during training need be considered as part of formal overall training requirements.

Thus, overall formal training requirements consist of the number of organizational training needs to be met by the training system and the increased performance standards (if any) to be attained during training.

#### INDIVIDUAL TRAINING NEEDS

The training needs of individuals should be known before they enter the training system; if trainees already know some of the subject matter or are able to perform some job tasks, it would be wasteful and boring for them to deal with those knowledges and tasks during training. Trainees of this sort will be among those who are already job incumbents but whose performance is not entirely satisfactory. Some new hires may also already be able to perform some job tasks because of previous training or experience.

Training needs among job incumbents can be indicated in three ways: (a) by having the workers themselves read the list of tasks obtained during task analysis and write down the code numbers of tasks on which they want training, or (b) by having the supervisors write down codes of those tasks on which each of his subordinates needs training, or (c) by giving the training system's knowledge and performance tests to all job incumbents. Since all job incumbents who need training, according to their own or their supervisor's indication, should be given the appropriate knowledge and performance tests to determine their precise training needs, it would be inadvisable to indiscriminately give all workers all tests and examinations.

The precise training needs of new hires should be determined by giving them the prerequisite test to qualify them for entrance into the training system and the system's knowledge and performance tests to determine how much of the subject matter they already know and the job tasks they can already perform, so that training can be concentrated according to individual needs. This pre-supposes, of course, that at least some portions of the training system are suitable for individualized instruction.

#### ACTUAL TRAINING REQUIREMENTS

Although it may be obvious, for the sake of completeness we state that actual training requirements are the individual training needs and the increased task-performance standards (if any) to be attained during training.

## CHAPTER 4

### TRAINING SYSTEM DESIGN

#### INTRODUCTION

Foregoing chapters have shown the kinds of information you must have before you can design an effective and efficient training system. Specifically, when you have determined overall training requirements, have determined or specified trainee characteristics, have determined the necessary subject matter, and have determined the constraints on the system's design, then and only then are you ready to begin your design. To proceed without having all this information would be to court failure.

At this point, if you have followed the analysis processes described in Chapters 2 and 3, you will have the needed information, except the complete overall training requirements. As noted in Chapter 3, overall training requirements consist of the tasks to be included in training and the special emphasis or attention that should be given to tasks, if any. How to select tasks for training on the basis of their criticality was shown in Chapter 3; but since decisions as to the kinds of emphasis or attention to give certain tasks pertain to problems of training design, we reserved complete determination of overall training requirements for this chapter.

To show what you should do to adequately design a training system, we shall discuss the following topics:

1. Kinds of task emphasis
2. Sequencing of training objectives
3. Lesson planning
4. Preparation of Lesson Plans
5. Design and preparation of materials



## KINDS OF TASK EMPHASIS

Since all learning deteriorates when what is learned is not frequently practiced, you may need to give special emphasis to tasks that are infrequently performed on the job to assure that trainees can perform them adequately when they are required.

You should consider three kinds of emphasis: an increase in the task performance standard to be attained during training, refresher training, and a task performance (job) aid. Which you choose, if any, will depend on the task's criticality.

If a task is infrequently performed and highly critical, you probably should increase the performance standard to be attained during training. In other words, you should increase the degree of learning so that even though the trainees forget some of what they learn, they will retain enough to perform in accordance with the job-entry standard when the task is required. If an infrequently performed task is not critical, brief refresher training or a job aid may enable trainees to perform adequately. Aids for deciding which emphasis to give a task, if any, are given in following sections.

### INCREASED TRAINING STANDARDS

Fortunately, most tasks included in training are performed frequently on the job, so when trainees attain the job-entry performance standards during training, the delay between training and job performance is too short to permit significant deterioration of learning. In other words, the job-entry standards and the training standards are the same.

When an increase in a training standard is indicated, we must be

concerned about the relationship between learning and retention of learning to assure adequate job performance. More specifically, we must be concerned about the degree of forgetting during different periods of delay to get an indication of the degree to which learning should be increased.

To illustrate the relationship between learning and retention and its implications for training, we must talk about normal learning and overlearning.

Normal learning is the degree of learning required during training to assure that a task can be performed at the job-entry standard, if it is performed soon and frequently after job-entry.

Overlearning is some degree of learning above normal to assure that a task infrequently performed can be performed at the job-entry standard when it is required. For convenience we shall designate three degrees of overlearning: some, moderate, and much.

Normal learning and the three degrees of overlearning are shown in Figure 7 in relation to monthly periods of delay in job-task performance. You should be aware, however, that Figure 7 is an hypothetical graph prepared merely for the purposes of illustration; that is, the graph does not represent any specific set of actual data - it is a generalized representation of what we know about the relationship between learning and forgetting.

The horizontal dotted line in Figure 7 represents both normal learning and the job-entry standard of task performance. The slanted horizontal lines represent deterioration of learning when what is learned is not practiced. Experience has shown that the rate of

deterioration (forgetting) is essentially the same regardless of the degree of learning. That is why the lines depicting deterioration are parallel. There is one exception that we will note at the appropriate point later on.

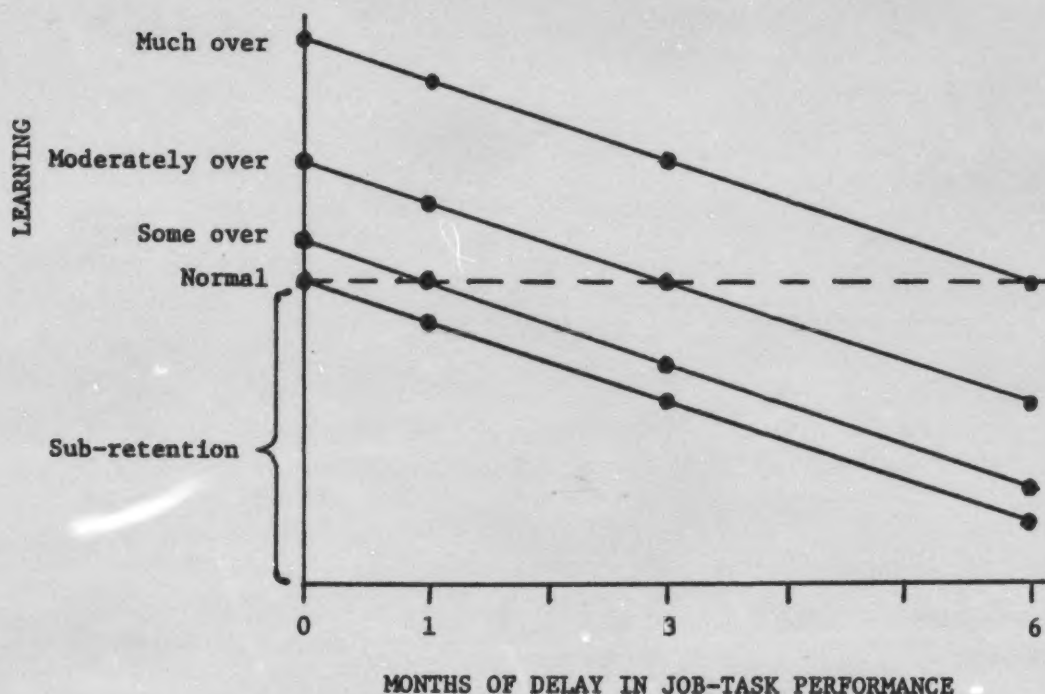


Figure 7. The Relationship of Learning and Retention of Learning Over Time

Note in Figure 7 that, hypothetically, if a critical task is performed only monthly and only normal learning has occurred, retention would be sub-normal when performance of the task would be required; however, if some overlearning occurred, enough learning will have been retained to permit performance of the task at the job-entry standard. Also, hypothetically, according to Figure 7, moderate overlearning will permit adequate

task performance after a delay of three months, and much overlearning will permit a delay of six months.

Overlearning is achieved by additional practice, and the higher the degree of overlearning the greater the amount of practice that is required. Since practice requires time and other training resources which represent costs, you as the training designer must carefully weigh the amount of overlearning that may be required. Overlearning to a degree greater than necessary is unnecessarily costly. Therefore, you need a framework in which to think about necessary degrees of overlearning.

Indications of required degrees of overlearning can be obtained by relating specific task criticalities and performance frequencies. This is done in Table 3.

TABLE 3  
INDICATORS OF REQUIRED DEGREES OF TASK OVERLEARNING

| TASK CRITICALITY                 | TASK PERFORMANCY FREQUENCY |           |                       |
|----------------------------------|----------------------------|-----------|-----------------------|
|                                  | Monthly                    | Quarterly | Semi-annually or less |
| Critical to Very Highly Critical | Some                       | Moderate  | Much                  |
| Moderately Critical              | None                       | Some      | Moderate              |
| Rather Critical                  | None                       | Some      | Some                  |
| Slightly Critical                | None                       | None      | Some                  |

Overlearning, according to Table 3, is definitely indicated for critical to very highly critical tasks, but for less critical tasks, the needs for overlearning may be replaced by refresher training or job aids. If so, the cost of training can be reduced.



We realize that the degrees of some, moderate, and much overlearning are not very definitive and, therefore, not very helpful; but they do serve to alert you to tasks which need special emphasis. When overlearning is needed, you should provide for it in the training requirements by increasing the task's training performance standard (above the job-entry standard).

You can increase a performance standard by increasing the amount or accuracy of work or by decreasing performance time. Which you do depends on how the job-entry standard is stated.

If performance time is fixed, but the quantity or quality of work can vary, you can increase the training standard by the quantity or quality of work, or both. The degree of increase depends on what your, or your organization's supervisors know about the deteriorations of task performance over different periods of time. An example may help. Secretaries or others who are required to take shorthand usually have a job-entry performance standard. If the standard is 100 words per minute but the trainees will neither practice nor perform on the job for six months (as is often the case) the training standard should be increased to 125 words per minute, because experience has shown that the average decrease in shorthand skill is about 20 per cent in six months.

If the amount of work is set, as in a specific task procedure, then both work accuracy and performance time can vary. If accuracy is critical but time is not, increase the accuracy standard. If both are critical, increase both.

If a job-entry standard represents the limits or almost the limits of average human ability, then you must concentrate on developing

trainee ability to perform at that standard so readily and unconsciously that he can perform on demand almost, as we say, "in his sleep." This represents the exception to the general statement that the rate of forgetting is essentially the same regardless of the degree of learning. If the job-entry performance standard is at the upper average limit of human ability, you can hardly increase the standard, but additional practice when one has reached the upper limit reduces the rate of forgetting. In other words, when one has learned to perform a task as well as he ever could and stops at that point, forgetting of what he learned will be faster than when he continues to practice for a while at the upper limit of performance. The amount learned is not increased but, as psychologists say, what is learned is "burned in" so that it is more easily retained. For practical training purposes, the result is the same as if the performance standard had been increased -- additional practice enables the trainee to perform at the maximum standard even if performance on the job is delayed, and the greater the degree of additional practice, the longer the delay in performance can be.

If moderate overlearning is indicated for a moderately critical task, cost may be reduced by reducing overlearning to some and additionally assuring adequate job performance by providing either refresher training or a job aid.

When some overlearning is indicated for moderately or less critical tasks, either refresher training or job aids probably can be substituted.

The strictness of task performance standards can help you decide whether refresher training or job aids should be provided. Look again at the categories of strictness and their definitions in Chapter 3.

When tasks are infrequently performed, refresher training may be most appropriate for some classified as moderately strict, but job aids usually are most appropriate for tasks classified as rather strict and not strict, except when time will not permit use of an aid.

#### REFRESHER TRAINING

Refresher training, in a strict sense, is retraining in job tasks once learned to some degree. Refresher training in the sense of giving job incumbents new information or skills is not considered here.

Refresher training can occur in several ways: Supervisors or qualified peers can help retrain personnel by reviewing the knowledge requirements and coaching the retrainees in task performance; retrainees can use their training manuals or notes to refresh themselves in the job situation; or they can be rescheduled for formal refresher training. The first two approaches usually are used because, in general, they are more economical.

#### JOB AIDS

Job aids often can be used to reduce training requirements for a variety of procedural tasks, provided that performance of the tasks does not require immediate reaction to events, such as in counseling to maintain an appropriate relationship with a client, or as in driving to maintain control of a car. Such requirements do not permit time to refer to job aids. But when the nature of tasks and their performance standards permit reference to job aids, their use may eliminate the need for over-learning or even eliminate the need for formal training. In the latter

case, trainees would need to learn only how to use the job aid.

Job aids fall into three major categories: (a) those intended to assure complete performance of job tasks, (b) those intended as guides for task performance until a task is self-learned on the job, and (c) those intended to support partially trained behavior until learning through practice on the job eliminates their need.

Many highly critical procedural tasks require job aids to assure complete performance. Aids of this sort are intended to be a substitute for learning; that is, the job incumbent is required to use them each time the tasks are performed to assure that nothing is forgotten. Such aids are check lists provided to airline crews for checking out the readiness of a plane for flight. The crews are cautioned not to attempt to learn the procedures and rely on their memories.

Job aids which permit self-learning on the job usually consist of task-performance procedures and pertinent critical information, such as precautions. Eventually, a task that is performed with such an aid will be learned to a degree that will reduce reliance on it, but it is retained for reference when needed.

Aids intended to support partially trained behavior usually are the formal training materials retained by the trainees for use as aids in job-task performance or for review (refresher training) as needed.

Tips for the preparation of job aids are given in the last section of this chapter on the design and preparation of materials.

When you have specified the increased performance standards for selected tasks (if any) and have decided on the job aids to provide,



you will have completed determination of the training requirements. Job aids modify the training requirements because they reduce or eliminate training on the tasks to which they apply, but trainees must learn how to use them, so this kind of instruction, though of small amount, must be added to the training requirements.

For each job aid you must state that the trainees must be able to use it (a training objective) and then state the procedural steps for its use (subject matter). Having these materials added to the other training objectives you are ready to sequence them all.

#### SEQUENCING OF TRAINING OBJECTIVES

The purpose of sequencing training objectives is to organize subject matter so that it is both meaningful and easy to learn. This purpose can be achieved by applying these rather simple rules:

1. Divide the training objectives and subject matter into units of instruction. A unit consists of those objectives and subject matter which represent a job duty.
2. If two or more duties are performed in sequence on the job (seldom the case), order the duties (units of instruction) in that sequence.
3. If duties are not sequentially related, the order should be governed by the arrangement of tasks according to the rules in Steps 6 and 7.
4. Divide each unit of instruction into lessons. A lesson consists of those training objectives and subject matter which represent a duty task.
5. If tasks that make up a duty are performed in sequence on the job, order the tasks (lessons) in that sequence.
6. When tasks are not sequentially related, start with the least complex and progress to the more complex. Least complex tasks are those which have fewer enabling objectives. (Remember, enabling objectives are the subobjectives of

job-task training objectives and knowledge attainment training objectives).

7. In addition to, and in some cases instead of the rule stated in Step 6, pay attention to the enabling objectives in the unrelated tasks. If one or more of the same enabling objectives are required in two or more tasks, arrange the tasks so that the enabling objective or objectives are learned first and then practiced in close order as they are performed in successive tasks. This will increase the efficiency of your system.

When you have sequenced the training objectives in the manner described, you will have established the instructional units and lessons in their most meaningful and efficient order.

Fortunately, if the task analysis which produced the training objectives and subject matter was done well, the ordering of subject matter within lessons will have already been done, but you must give this careful attention when you select instructional strategies, which is the first step in lesson planning.

#### LESSON PLANNING

After arrangement of training objectives and subject matter into instructional units and lessons, lesson planning is the most critical part of training design. It includes specification of (a) when and how knowledge will be presented, (b) when and how knowledge will be practiced, (c) when and how job-task behavior will be practiced, and (d) when tests will be administered to establish training quality control. In other words, when you complete the lesson plans you will have specified the functions of the training system. To help you do this we shall discuss the following topics:

1. Presentation of knowledge
2. Practice of knowledge
3. Practice of job-task performance
4. Quality control
5. Arrangement of system functions
6. Selection of methods and media
7. Preparation of lesson plans

#### PRESENTATION OF KNOWLEDGE

If trainees are to gain new knowledge it must be made available to them in some manner. This obvious fact tends to delude some training personnel into thinking that efficient training is best achieved by the easiest means of presenting information -- by lecture, assigned reading, graphics, television, films, or tape recorders -- but ease of presentation, although to be desired, must not be the major criterion; the presentations must also be effective -- the trainees must learn, must attain the training objectives. Although research has demonstrated that gifted persons learn well regardless of how information is presented, most require carefully prepared materials.

Efficiency (ease) of learning also is important. For all persons, learning is most efficient when presentations are integrated with other system functions, chiefly practice. We must always keep in mind that anyone learns best by doing! As a training designer, then, you should provide for ample practice and for efficient presentation of knowledge in relation to practice.

#### PRACTICE OF KNOWLEDGE

Knowledge is anything that becomes involved in our mental, symbolic processes -- facts, words, concepts, images, principles. Some sort of

knowledge is prerequisite to the performance of any job task. Although practice of task behavior, such as required in machine operation or in interviewing or counseling, is necessary for development of skill, mental practice of a procedure or mental practice in applying principles usually reduces the time required to develop a skill. As Smith (3) noted, however, the knowledge must be practiced to a high degree of mastery.

#### PRACTICE OF JOB-TASK PERFORMANCE

The training objectives and subobjectives specify the behavior that must be learned, and the performance standards specify the degree to which it must be learned through practice, and practice of performance in a formal training situation is provided for in practical exercises which you must design.

A practical exercise is, to some extent, a simulation of the job conditions under which the trainees practice. The closer the simulation of the actual job situation the better the learned behavior will transfer to the job. The actual job situation is provided in on-the-job training, and in some instances job situations can be closely simulated in formal training by using job equipment and materials, such as machines and forms. When trainees must learn to interact appropriately with persons, as in client relationships, the job situations can be simulated effectively by role playing (See Appendix A).

For all designs of practical exercises, you must carefully consider both the behavior and performance conditions specified in the training objectives and simulate job conditions as well as possible to assure transfer of trained behavior to the job.



## QUALITY CONTROL

By training quality control in this content we mean provision for administration of knowledge and performance tests at some point or points within the time frame of each lesson to determine whether the trainees attain the lesson objectives. This and other aspects of quality control are discussed in detail in Chapter 5.

## DEVELOPMENT OF INSTRUCTIONAL STRATEGIES

Hopefully, at this point you have fairly good ideas of the four system functions discussed above. Now, to piece together the skeletal structure of your system, you must relate these and other system functions so that each can contribute as well as possible to the system's effectiveness and efficiency. To do this you must decide, in relation to each training objective and its subject matter, when each function should occur. Let us call this process the development of instructional strategies.

The most effective and efficient instructional strategies are those which provide for meaningful learning contents, presentation of knowledge in close relationship to the behavior to be learned, and opportunities to practice as soon as possible after knowledge is presented.

Meaningful contents are created at the beginning of and throughout a course by:

1. Orienting the trainees to the overall course -- its purpose, what it will enable the trainees to do, and how the course will be conducted.
2. Orienting the trainees to each unit of instruction before instruction in that unit begins -- what the trainees will learn, how the unit relates to the overall course, and how instruction will proceed.

3. Orienting the trainees to each lesson before instruction in that lesson begins -- the specific training objectives to be attained and their significance, and how instruction will proceed.
4. Relating each block or bit of knowledge to be learned to something the trainees already know (starting where they are), and helping them to understand why the knowledge is necessary to adequate task performance.

Presentation of specific knowledge necessary to adequate task performance immediately before practice of the knowledge or behavior begins and opportunity to practice immediately can be provided by emphasizing doing (practical exercises) rather than relatively passive reading, observing, or listening. This means that most knowledge should be presented in small bits immediately before practice begins in a laboratory or workshop situations, rather than in large segments before there is opportunity to practice. When information is presented in large segments it is seldom retained, so it must be repeated in the practice situation. It is more economical to present it only in the practice situation where it is put to immediate use and, therefore, retained.

If a training objective is complex, opportunity to mentally practice the enabling knowledge (such as a performance procedure) before practice of performance begins usually speeds up learning to perform. You should also provide for mental practice immediately after the knowledge is presented.

When you have decided on your instructional strategies, you will be ready to complete the design of your system by selecting the training methods and media to implement the strategies.

## SELECTION OF METHODS AND MEDIA

Instructional strategies specify when and where the different kinds of learning activities will occur but do not specify how they will occur. The how of instruction resides in the training methods and media you choose to make the training system functional.

Although methods and media are inseparable in a practical sense, because some medium or combination of media is always necessary to implement any method, it is convenient to discuss them separately.

### Methods

Numerous methods and techniques have either evolved or been invented for instructional purposes. Some are as old as human communication, some are rather new. Seventeen methods which consist of different combinations of 14 techniques are defined in Appendix A, together with descriptions of their characteristics and uses. These may be quite helpful to you in deciding how to design lessons. More detailed information on methods is given in the Training and Development Handbook (8).

### Media

To implement the methods you choose, you must also select the media for presenting knowledge and otherwise assisting trainees in learning. Gagne (9) has listed seven things that media do to make learning possible and efficient. The explanations of these things, given below, are provided by Spangenberg, Riback, and Moon (10):

1. Present stimuli. Even the simplest type of learning requires a stimulus, and as the types of learning become more complex, various kinds of stimuli are necessary to make learning both possible and efficient.
2. Direct student activities. Various kinds of stimuli must

direct student attention and otherwise indicate to the student what he must do in the learning situation.

3. Provide models for terminal performance. Such models orient the student to the nature of the behavior he must learn.
4. Provide prompts. For most kinds of learning, prompts should be available to the student. For example, learning of verbal and motor chains is made easier if demonstrations or models provide prompts to help learning of proper sequences. Then, too, multiple discrimination learning is made easier if prompts or cues make differences in words or things more distinctive.
5. Guide thinking. Efficient learning of mental skills requires hints or suggestions to guide student thinking. Such guidance helps the student to make connections between concepts which he can use to form principles, and to discern relationships between principles which he can use to solve problems.
6. Induce transfer of knowledge. The process of learning to transfer knowledge to novel situations usually is begun by asking the student questions of the problem-solving variety. Demonstrations may also aid this kind of generalizing (transfer) to other things or situations that are similar to, but not the same as, those used to teach the concepts or principles or those used to demonstrate how the knowledge can be generalized. Visual exhibits also can induce transfer by illustrating the kinds of things or situations to which the knowledge applies.
7. Provide feedback. An important condition for learning is to let the student know whether the consequences of his learning are correct so that the learning can be reinforced if correct or be restructured in incorrect.

Media in themselves -- persons, machines, films, books, graphics, etc. -- are not very important. What is important is what media can do that you want done. This must be the first basis for choosing media, so you need to know their various capabilities. Perhaps the best single source of this information is a handbook and catalog prepared by Boucher and others (11). The book also contains descriptions of media, criteria for media selection, and a list of media manufacturers. Spangenberg,



Riback, and Moon (10) also provide media selection criteria and review guidelines found in the literature for using various media capabilities.

When you have selected methods and media, you will have completed the basic design of your system. The design then must be documented.

#### PREPARATION OF LESSON PLANS

A prepared lesson plan documents a lesson's design and everything to be included in a lesson. It thus becomes the "blueprint" to be followed by those who prepare training materials, and the guide to be followed by instructors and training administrators. To be adequate, a lesson plan must include the following information:

1. All training objectives and subject matter (or their code references) covered by the lesson.
2. Lists of all needed supplies and media hardware and software.
3. Specifications of the training method or methods to be used.
4. Precise prescriptions for the development of training materials.
5. Complete sequential descriptions of all trainee and instructor activities.
6. Specification of tests and when they are to be administered.

#### DESIGN AND PREPARATION OF MATERIALS

The guidelines presented here for the design and preparation of training materials are adaptations of those provided by Miller (12) for development of training manuals. They apply also to the preparation of job aids.

Since the purpose of training materials and job aids is to guide

trainees in task performance, they must be purposive, accurate, complete, and concise.

To make material purposive, state the task objective, and if the purpose of the task is not obvious in the objective statement, explain it. Then accurately state all steps in the task in their exact sequence.

Be sure that all information necessary for adequate and safe performance is included in relation to each step, but give only the information found in the product of task analysis. Resist all temptations to add background or other nice-to-know information.

Be sure that the order of all information you give is in the exact order in which it should be used in performing a task step. This applies to pictures, paragraphs, sentences, and even to phrases within sentences.

Be concise! Use only those words necessary for accurate and clear communication.

Write to exactly express, not to impress! Use simple sentences and little words. Remember, big persons use little words, little persons use big words. If you must use technical terms, be sure to clearly and simply define them.

If you use photographs, drawings, or graphs, follow these tips:

1. Closely relate them to your textual material so that their meaning and usefulness are perfectly clear.
2. Take photographs or make drawings from the trainee viewpoint - as he will see the objects in the job situation.
3. If it is necessary to show critical aspects of an object that cannot be shown from the trainee viewpoint, clearly explain the nature and purpose of the view.

4. Direct attention to critical parts of a photograph or drawing by using arrows, different colors, or some other effective means of "calling out" what the trainee must see.

If you follow these guidelines, your material probably will be easy to read and understand. In general, the readability of textual training material should not be above the 10th-grade level.

There are many formulas for estimating readability, but most require too much tedious work. HumRRO has developed one, however, that is both simple and more accurate than other formulas (13). Here is how it works:

1. Take any block of 150 words.
2. Count the number of one-syllable words. (A one-syllable word, for this purpose, is one that has the sound of one syllable when it is spoken.)
3. Divide the number of one-syllable words by 10.
4. Subtract the result of Step 3 from 20. The number obtained is the grade reading level.

For example, if the number of one-syllable words is 105, the grade reading level would be 20 minus 10.5 -- a 9.5 grade level.

To estimate the grade reading level of an entire training manual, repeat the steps above on every tenth page of reading matter and average the grade levels you get. For example, if you get 10.2, 9, 8.6, and 9.8, you would have  $10.2 + 9 + 8.6 + 9.8 = 37.6/4 = 9.4$  grade level.

If the readability of your material is above the 10th-grade level, you should revise it to increase the number of one-syllable words.

## Chapter 5

### TRAINING QUALITY CONTROL

#### PURPOSES AND FUNCTIONS OF QUALITY CONTROL

The purposes of training quality control are (a) to determine whether the trainees actually attain the training objectives, and (b) to continually check the effectiveness of the training system. Both purposes are achieved by developing knowledge and performance tests and administering them during development of the system and during its continual operation, and by getting feedback of job performance data on graduated trainees and information about changes in job tasks.

Overviews, rationales for, and critical characteristics of these quality control functions are given in the sections on developmental testing.

#### DEVELOPMENTAL TESTING

As mentioned in Chapter 1, the prerequisite test, knowledge and performance achievement tests, and the final performance test are used in developing the training system to assure that all instructional components achieve their respective training objectives. This is a critical quality control function.

All trainees used in developmental testing must be screened by the prerequisite test to assure that they have the basic knowledges and skills necessary for entering the system.

Knowledge and performance achievement tests must be given upon completion of each unit of training during development of the system



to determine whether each unit is effective in meeting its objectives. Many developers of training systems have relied solely upon the final performance test to check their work, and when trainees were found to be deficient in performance the system developers had no way of knowing which units were at fault. So, during development of a system, the quality of each unit of instruction must be measured to determine at that point whether inadequacies must be identified and corrected. If the quality of the first unit is not determined but the second unit is checked, and if faults in the second unit are indicated, the developers do not know whether the faults are actually in the second or in the first unit or in both, and so on.

In developmental testing, the final performance test is vital. Although the trainees may have passed each achievement test during developmental testing, deficiencies in trainee performance may appear during the final test. If so, inadequate trainee performance at this point usually is due to learning not sufficient enough at one or more earlier points in the system to sustain delayed performance. If items of the final test are keyed to units of instruction in the system, the faulty unit or units can be identified, and additional practice to increase learning can be provided. Means, in addition to testing, for diagnosing system faults are discussed later in this chapter.

#### OPERATIONAL MONITORING FOR QUALITY CONTROL

When the system is refined and ready for operation, the prerequisite test should be used to screen all potential trainees, as in developmental testing, to determine their basic knowledges and skills.

Those suspected of having knowledges and skills usually learned during training should be given the appropriate knowledge and performance tests to determine their precise training needs. For this purpose an alternate form of the knowledge tests should be prepared; that is, the test problems used for determining individual training needs should be different from those used to determine trainee achievement during training. This requirement does not hold, however, for job-task performance tests, because most job tasks can be performed adequately in only one way.

During operation of a system, the knowledge and performance achievement tests must be continually administered to monitor the system for quality control. The results will indicate not only whether trainees are attaining the training objectives, but whether the effectiveness of the system is deteriorating. Unfortunately, wherever humans are involved in systems, the system functions are likely to vary and change. As developed, the training system may be nearly perfect, but over time its quality usually degenerates, and the results of continual testing are the only means of determining when it occurs; perhaps the instructors have become lax, perhaps training administrators have become somewhat indifferent, perhaps the trainees are not applying themselves. Whatever the cause, inadequate test results will indicate trouble to be identified so that corrective action can be taken.

If the refined system and knowledge and performance achievement tests are adequate, the final performance test probably will not be necessary for monitoring the system; but to conserve testing time and money, some training administrators may use only the final performance

test instead of knowledge and performance achievement tests, a practice not recommended for reasons given later in this chapter.

#### FEEDBACK OF JOB PERFORMANCE INFORMATION

Another important but more difficult function of quality control is that of obtaining feedback of job performance data on former trainees and changes in job tasks.

Trainee job performance data is necessary to determine whether trainee behavior is transferring to the job. If not, the training system and tests should be further refined.

Changes in job tasks, if not known and acted upon by training personnel, can make the system obsolete. To be kept effective, the training system must be revised in accordance with changes in job tasks.

#### KNOWLEDGE AND PERFORMANCE TESTS

Our use of the terms "knowledge tests" and "performance tests" is an effort to distinguish between measurement of job-related knowledge and actual job behavior. Knowledge tests usually are of the pencil-and-paper sort with which trainees work alone; whereas, in performance tests the tester observes trainee behavior to determine whether it is adequate, accurate and in accordance with performance standards. Some actual job behaviors, however, are measured by pencil and paper; for example, if a portion of a job behavior is to complete a form, the trainees should be given the form and be required to complete it accurately within the specified time limitation.

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It seems important to note here that both knowledge and performance tests actually measure trainee performance. The only difference is that job-task behavior can be measured directly by observation and scoring; whereas, knowledge can be measured only indirectly by measuring the results of performance made possible by the attainment of knowledge, such as statements of facts and principles, explanations, etc.

We could state numerous other descriptive characteristics of tests, but these are unimportant; they do not tell us the essential characteristics of good tests, which we must know if we are to construct them.

#### ESSENTIAL CHARACTERISTICS OF TESTS

If knowledge and performance tests are to be useful in training quality control, they must have two essential characteristics -- validity and reliability.

#### Test Validity

There are three kinds of test validity: (a) content validity, (b) sampling validity, and (c) predictive validity.

A test item is said to have content validity when it requires the trainees to perform in the testing situation as specified in the training objective. For example, if a knowledge objective specifies that the trainees must be able to add columns of five two-digit numbers, the test item would have content validity if the trainees are required to add columns of five two-digit numbers, no more and no less. If the test



item requires more or less, the content of that item would be considered invalid. In a performance test, if the training objective requires the trainees to perform a certain procedure, the content of the test item would be valid if it requires actual procedural performance, but it would be invalid if the item requires the trainees only to state the steps in the procedure. Statement of procedural knowledge and actual performance of the procedure definitely are not the same things. Content validity of a test item also would be diminished if either the conditions or the standards of performance are different from those specified in the training objective.

Quality control personnel often find it necessary to reduce content validity of test items when the specified job-performance conditions cannot be duplicated in the testing situation. In all such instances, however, test constructors must be careful to simulate as closely as possible the specified conditions to assure that the trained behavior transfers to the job.

Sampling validity of a test depends on how well the test represents the scope of knowledge or the scope of job behavior required in the training objectives. For a test to be completely valid in this sense, every objective would be measured by at least one item; and for the testing to be completely valid every trainee would be tested on every objective. In some training programs, testing every trainee on attainment of every training objective may not be feasible because of time and cost limitations. Therefore, it is the responsibility of the training quality control personnel to select those training objectives for testing which adequately represent the totals of knowledge and

behavior to be learned. If the selected sample adequately represents the overall training objectives, the test is said to have sampling validity.

Testing time and cost can be reduced and still retain test sampling validity if only the final performance test is used, provided that it measures all job-task performances. As mentioned earlier, use of only the final performance test is not recommended if it is feasible to administer the knowledge and performance achievement tests. The reason is that if trainee performance deficiencies appear during the final test, the deficiencies would indicate failure to attain enabling knowledges and skills, but the precise deficiencies usually would not be identified; rather, only the areas of deficiency would be indicated, and it would be necessary to administer the knowledge and performance achievement tests within those areas to precisely identify trainee deficiencies. Moreover, at this point when all training has been ostensibly completed, it would be inefficient and too costly to recycle the trainees for remedial training, but if deficiencies are identified by knowledge and performance achievement tests during training, it is relatively simple and economical to give remedial training.

To reduce testing time and cost, some training administrators unwisely test attainment of a particular, biased sample of training objectives; for example, only the more easily tested, or the least costly to test, or those most recently trained on, or some similarly biased sample. Such samples are invalid, because the attainment of some objectives never had the chance of being tested. Another reason this

practice is inadvisable is that instructors know the objectives which will be tested and, being human, concentrate on training for those objectives and slight training for those not tested. This can hardly be called quality control.

To assure that tests have sampling validity, the items to be used in shorter tests should be selected from a population of items which represent all training objectives. If time limitation allows for only half of the items to be administered, selection of the items can be done by flipping a coin for each item and designating either heads or tails as the criteria for item selection. If only a quarter of the items can be administered, the items can be selected by thoroughly shuffling a deck of playing cards and dealing one card for each item. Only those items which receive a given suit, such as hearts, would be selected. Flipping a coin, dealing cards, drawing numbers from a hat, or any other mechanical procedure which does not permit the operation of selection bias, is called selection at random. If items are selected at random, and if all items representing all training objectives are given a chance to be selected, the resulting sample would have sampling validity. The only other requirement is that a different sample be drawn for each succeeding class of trainees so that, over time, all items will have been administered at one time or another: the laws of chance assure that. Although this kind of sampling procedure does not give complete quality control for each class of trainees, the probability is that the quality of all aspects of instruction will have been checked during some replication of the training program.

When objectives are unequal in criticality, a simple random sampling procedure of the type described is not appropriate. If sampling is necessary and the objectives are unequally important (in the sense of being equally necessary to the system's operation), a modified (restricted) random sampling procedure should be used to increase the probability that the more critical objectives are included in the sample to be tested. For example, if a few objectives are highly critical and the remainder are only moderately critical, one should include all the highly critical tasks and complete the sample by randomly selecting from those which are moderately critical.

When the validity of a test is diminished by changing the performance conditions in the test situation or by selecting a sample of training objectives for testing, the adequacy of testing can be checked by determining a test's predictive validity.

Predictive validity of tests is established by comparing the performance of trainees on tests in the training situation with their actual job performance. This means that quality control personnel must obtain job performance evaluations of trainees after they begin actual job duties. The most reliable job performance data are obtained when trained observers of job performance record them. Most often, however, these data are obtained from supervisors. Regardless of the source, the data must be accurate if the predictive validity of training tests is to be reliably established. If the trainees can perform according to job-entry standards as predicted by the tests, the tests are said to have predictive validity. If not, there are



deficiencies in both the training system and the tests which must be found and corrected.

### Test Reliability

A test is said to be valid if it measures what it is supposed to measure. It is said to be reliable if it measures what it is supposed to measure each time it is administered. This means that a given degree of trainee attainment of knowledge or performance ability must always receive the same score. Test reliability, therefore, depends upon the control of factors which can affect the test scores. These factors are:

1. The test instructions
2. The conditions under which the test is administered
3. The scoring procedure
4. The trainee being tested
5. The tester

The key to obtaining high test reliability is standardization. That is, the conditions and procedures of test administration and scoring must be the same as much as possible for all trainees being tested.

Test Instructions. Instructions to the trainees on what to do to take the test should be clear and simple; they should not be required to interpret (or misinterpret) difficult words of convoluted language.

Although the instructions should include everything the trainees need to know, the test administrator should read the instructions aloud at the same time the trainees are reading them. If trainees ask questions pertaining to test items, they should be directed to re-read the instructions. The instructions should include information on how the test

will be scored, whether speed or accuracy is most important, and the testing time limitation.

Testing Conditions. As Osborn (14) has noted, the conditions during test administration which must be held constant for all trainees are of two general types: those pertaining to test supplies and those pertaining to the testing environment. Test supplies in the broadest sense include equipment and persons to be worked with or on during testing, tools, and paper and pencils, when appropriate. All equipment must be restored to its pre-test condition before being used by successive trainees. The test administrator must pay careful attention to environmental factors -- the time of day, temperature, lighting, noise level, and his own attitude and behavior.

The importance of holding environmental conditions constant for each person being tested is illustrated by an example given by Smith (7). Suppose that numerous races are to be held to select the national champion high school runner with each race to occur on the runner's own school track on a given day in the year. Would these arrangements assure equal conditions for all competitors? Certainly not. The tracks might be of different lengths; some may be of grass turf, while others are covered with cinders; and various weather conditions might hold in the different locations, such as rain, hail, sleet, or warm sunshine. Under these conditions, the winner probably would not be the fastest runner but the one who ran under the best conditions. Similarly, in a testing situation to determine the attainment of training objectives, some who actually were able to perform well under stan-

dard conditions may fail to demonstrate attainment of the objectives because of adverse conditions.

Test Scoring. If inconsistency in test results is to be avoided, particular care must be given to the design of test items which can be scored objectively rather than subjectively at the whim of the scorer. As noted by Osborn (14), objectivity in scoring depends on the degree of agreement that can be achieved between individuals who score a test item. In pencil-and-paper tests, items which permit multiple and true-false choices and sentence completion answers can be scored objectively, because it is a simple clerical task for each scorer to determine whether the trainee responses are correct. The other extreme is represented by essay-type tests where, as Osborn notes, "It has been observed that a single person is often hard put to rescore the same response with any degree of consistency." Scoring objectivity also is difficult to achieve when testers must observe and score trainee job-task behavior. Objectivity in scoring such performance tests can be achieved only by preparing a clear statement of exactly what the scorer must observe, by setting precise standards (criteria) for scoring, and by training the scorers to apply the observation procedure and scoring standards. Training of scorers can be considered adequate only when different scorers can observe the same trainee behavior and report the same score.

Development of test items to assure objectivity in scoring is discussed later in this chapter.

The Trainees. Trainees sometime contribute to test unreliability. Lack of motivation, fear of being tested, fatigue, illness, annoyance at improper tester behavior, all many cause trainees to score poorly when, under standard circumstances, they could demonstrate attainment of the training objectives.

The Tester. Smith (7) has emphasized the importance of preparing persons for test administration and their behavior in the testing situation. They should be carefully instructed on how to help the trainees understand their test instructions and how to treat the trainees, which trainee questions to answer and how to answer them, how to provide and lay out appropriate equipment and supplies, and when to postpone testing if unexpected circumstances create non-standard conditions, such as breakdown of air conditioning equipment, trainee illness, excessive noise, and the like.

The tester must maintain a calm and professional attitude at all times. Especially important is non-differential treatment of the trainees. The person administering the test should avoid:

1. Sarcasm when trainees make errors.
2. Giving away correct answers by facial expressions, gestures, prompts, or hints.
3. Deliberately misleading or tricking trainees.
4. Creating anxiety in the trainees by severe speech, facial expression, or attitude.

#### DEVELOPMENT OF TESTS

As emphasized in previous chapters, the training objectives, in addition to being the bases for design of the training system, are the



prescriptions for the development of test items. If the content of a test item is to be valid it must faithfully represent (a) the behavior the trainees must demonstrate upon the completion of training, (b) the conditions under which the trainees must perform, and (c) the performance standard they must attain. But more than just the training objectives is needed to develop valid and reliable tests, because most of the content of many test items must come from the sub-objectives and the knowledge requirements. This is illustrated in Tables 3 and 4.

#### TRANSLATING TRAINING OBJECTIVES, SUB-OBJECTIVES AND KNOWLEDGE REQUIREMENTS

If the training objectives, sub-objectives, and knowledge requirements have been adequately stated, their translation into test items is a rather simple and straightforward process. In making a translation, the training objective should appear first. Such a format permits easy checking of the translation for adequacy and accuracy. This checking should be done by at least two other technically qualified persons to assure that the translations are valid representations of the training objectives, sub-objectives, and knowledge statements.

#### TEST ITEM COMPONENTS

Adequate specification of test items must include five components:

1. Tester instructions
2. Trainee instructions
3. Scoring data (the exact behavior or results of behavior to be checked)
4. Scoring criteria
5. Passing criteria

TABLE 3

## An Item For Testing Knowledge Attainment

Training Objective

Given paper and pencil, list in correct order within 5 minutes all procedural steps to be followed when interviewing parents at their residences.

NOTE: The test item for this kind of training objective would be administered during training to determine if the trainees have attained knowledge which prepares them to practice the specified behavior.

Tester Instructions

Seat trainees at alternate desks in a classroom and provide paper and pencils. Read test instructions to the trainees as they read them. Ask if they have any questions about the instructions and, if so, answer them, but do not answer other questions pertaining to the test item. Instead, ask questioners to re-read the instructions. Tell them when to start writing and when to stop.

Trainee Instructions

List all the steps you must follow when interviewing parents at their residences. The list of steps must be complete and in the correct order. You will have 5 minutes. The test administrator will tell you when to start and when to stop.

Scoring Data

These procedural steps must be listed:

1. Identify self to parent.
2. Gain entry to the residence.
3. Positively identify parent.
4. If positive identification is not available, ask parent to sign an identity affidavit.
5. If parent refuses to sign affidavit, report to my supervisor.
6. If parent signs affidavit, continue with the interview.
7. Using form DCW-XXX obtain from the parent all information the form requires and enter it on the form.
8. Have parent review information on the form and tell me whether it is accurate.
9. If information is inaccurate, correct it.
10. Have parent sign the form to attest that the information is accurate.

NOTE: These procedural steps are not given in the training objective, but they would be stated as sub-objectives of the training objective, and they must be copied exactly as they appear as sub-objectives.

Scoring Criteria

If a trainee fails to state the "if" conditions in Steps 4,5,6, and 9, each omission must be scored as an error.

Trainee statement of the steps need not be verbatim, but the meanings must be the same.

The steps must be in the order shown above.

Passing Criteria

The steps must be stated without error within 5 minutes.

TABLE 4  
An Item For Testing Job-Task Performance

Training Objective

Complete interviews with parents suspected of child neglect at their residences in an acceptable professional manner within 30 minutes.

Tester Instructions

Simulate the home environment of a parent suspected of child neglect by providing a room with a door and two chairs and a person not well known by the trainees to play the role of the parent. Have only the parent role player and the trainee being tested in the room during the sessions. Observe trainee behavior through a one-way viewing screen and listen to the conversation by a microphone concealed in the room. Instruct the person playing the role of the parent that there will be two sessions. In the first, the role playing parent will be unable to produce positive identification and will refuse to sign an identification affidavit, which will end the session if the trainee behaves appropriately by telling the role playing parent that he, the trainee, must report to his supervisor. The second session will begin with the trainee proceeding as if the role playing parent had agreed to sign an identification affidavit, and the session will continue until the interview is completed. Instruct the person playing the role of the parent to behave in a somewhat disgruntled and reluctantly cooperative manner, except when refusing to sign the affidavit. Explain that the purpose of this behavior will be to test whether the trainee can behave in an acceptable professional manner.

Provide the trainee with a clip board, an identification affidavit form, a form DCW-XXX, and a ball point pin. Read the trainee instructions to him as he also reads them. Ask if he has any questions about the instructions and, if so, answer them, but do not in any way otherwise indicate to him what he is to do.

Trainee Instructions For the First Session

You are to interview a parent suspected of child neglect. When requested by the test administrator, knock on the designated door and a person inside will answer. Then proceed with the interview as you have been trained. The parent's name is John Q. Smith. Although the person you interview will be playing the role of a parent, you are to behave as if you are interviewing an actual parent. The entire interview must be completed within 30 minutes.

Trainee Instructions For the Second Session

Now continue with the interview as if the parent had agreed to sign the affidavit.

NOTE: It would not be feasible to test a trainee on interviewing behavior with an actual parent at his residence. Therefore, the test designer must specify those conditions which are feasible and which seem adequate enough to test the trained behavior. Adequacy, in this case, depends greatly on how well the parent role player performs.

Table 4 CONT'D

Scoring Data, First Session

When identifying self to parent, did the trainee:

|                                          |                 |                |
|------------------------------------------|-----------------|----------------|
| Ask parent if his name is John Q. Smith? | <u>    </u> Yes | <u>    </u> No |
| State his own name clearly?              | <u>    </u> Yes | <u>    </u> No |
| Show parent his identification card?     | <u>    </u> Yes | <u>    </u> No |
| Explain the purpose of his visit?        | <u>    </u> Yes | <u>    </u> No |
| Behave in a non-threatening manner?      | <u>    </u> Yes | <u>    </u> No |

Did trainee ask for permission to enter room?

     Yes      No

Upon entering room did trainee:

|                                                                                                                     |                 |                |
|---------------------------------------------------------------------------------------------------------------------|-----------------|----------------|
| Ask parent for name-photocard?                                                                                      | <u>    </u> Yes | <u>    </u> No |
| (Name-photocard not available) ask parent for driver's license?                                                     | <u>    </u> Yes | <u>    </u> No |
| (Driver's license not available) ask parent for birth certificate?                                                  | <u>    </u> Yes | <u>    </u> No |
| (Birth certificate not available) ask parent for marriage license?                                                  | <u>    </u> Yes | <u>    </u> No |
| (Marriage license not available) ask parent if he would sign an identity affidavit?                                 | <u>    </u> Yes | <u>    </u> No |
| Explain the consequences of signing a false affidavit?                                                              | <u>    </u> Yes | <u>    </u> No |
| (When parent refused to sign affidavit) explain to parent he must terminate interview and report to his supervisor? | <u>    </u> Yes | <u>    </u> No |
| Behave in a professional manner during this portion of the task?                                                    | <u>    </u> Yes | <u>    </u> No |

Scoring Data, Second Session

Did trainee:

|                                                                  |                 |                |
|------------------------------------------------------------------|-----------------|----------------|
| Correctly fill out identity affidavit?                           | <u>    </u> Yes | <u>    </u> No |
| Get parent's signature in right place?                           | <u>    </u> Yes | <u>    </u> No |
| Accurately fill in all spaces on form DCW-XXX?                   | <u>    </u> Yes | <u>    </u> No |
| Write legibly?                                                   | <u>    </u> Yes | <u>    </u> No |
| Ask parent to review form information for accuracy?              | <u>    </u> Yes | <u>    </u> No |
| Get parent's signature in the right place on the form?           | <u>    </u> Yes | <u>    </u> No |
| Behave in a professional manner during this portion of the task? | <u>    </u> Yes | <u>    </u> No |

NOTE: The scoring data in this type of item must be based on both the sub-objectives of the training objective and the knowledge statements which will tell the trainee how to perform each step in the interviewing procedure. The scoring criteria below which describe non-threatening and professional behavior must be obtained from the knowledge statements on how to behave in a non-threatening and professional manner.



Table 4 CONT'D

Scoring Criteria

Non-threatening Behavior

Trainees behave in a non-threatening manner when:

1. Their facial expressions are relaxed and pleasant.
2. Their tone of voice and manner of speaking are natural and friendly.
3. They do not display a suspicious attitude in what they say.
4. They do not make threatening statements.

Professional Behavior

Trainees behave in a professional manner when:

1. They appear to be confident in their ability.
2. Their line of questioning is objective to obtain only the essential information without prying unnecessarily into the parent's privacy.
3. They are serious without being severe.
4. They are firm but patient when pressing the parent for necessary information.
5. They do not use sarcasm.
6. They do not make facetious statements.

If the trainee behaves in either a threatening or non-professional manner, the reasons for making this judgment must be stated so that the trainee can be given remedial training.

Passing Criteria

All checks on the trainee's performance must be in his favor, and the interview must be completed within 30 minutes.

Other valuable aids for test development have been provided by Bloom, et al. (15), Boyd and Shimberg (16,17), and Popham (18).

The kind of information contained in each of these components is illustrated in Tables 3 and 4. These tables are intended to give examples of adequate specifications of items for measuring attainment of a knowledge objective and a job-task performance objective.

For convenience, appropriate explanatory notes are included in the tables.

#### PREPARING TEST MATERIALS

When the specification of test components has been completed as in Tables 3 and 4, and they have been checked and approved by other competent persons, the test materials can be prepared.

Test materials include those for the tester and those for the trainee. Tester materials include tester instructions, scoring criteria, and passing criteria. If multiple-choice answer sheets are used, the tester materials include answer keys for rapid scoring.

Trainee materials include instructions for taking the test, the test items, and other materials as appropriate, such as forms to be completed or multiple-choice answer sheets.

#### TESTING THE TEST

Testing the test, especially a task performance test, is a vital step in test development, because it is almost impossible to anticipate all the problems which may affect test reliability, and the purpose of testing a test is to identify those problems and resolve them.

### Pilot Test Conditions and Procedure

The conditions for testing the test should be the same as specified in the tester instructions, just as if the test were being administered as a regular quality control function, except for the special requirements for obtaining information given below.

If a test is designed for group administration, at least five trainees should be used in the first trial and in each successive trial after revisions have been made. Discovery and correction of test deficiencies should be continued until all have been corrected.

When a test item has been proved to be free of deficiencies it should be dropped from the pilot test to reduce the amount of work.

### Information To Be Obtained

Pilot test administrators should use the following techniques to get information pertaining to test items:

1. Ask trainees to repeat the instructions in their own words; if their understanding is deficient, revise the instructions.
2. Record all questions asked by the trainees about the instructions so that instructions can be prepared to answer them.
3. Note any difficulties with equipment or supplies.
4. Note ways in which layout of equipment or supplies may be improved without reducing test validity.
5. Note accidents or near accidents which may damage equipment or injure trainees.
6. Note the time testers spend and the problems they encounter in reestablishing the test situation for successive students.

7. If testing stations are used, note problems in maintaining a smooth flow of students from one station to the next.
8. Note all conditions and happenings which might invalidate the test items.
9. If a trainee makes an error, find out if he erred because he misunderstood the item.
10. Observe the behavior and attitudes of the testers which might affect the reliability of the test scores.

Information pertaining to test scoring should be carefully gathered. To adequately check the reliability of test scoring, the scores of at least two testers must be compared, and each scorer must work independently of the others; they must not talk to each other nor compare scores until all scoring is completed. The scores to be compared must be those the scorers have given to a single trainee; if the trainee has been given the same score by all scorers, the scoring procedure can be considered reliable. If the scores differ, the causes must be found. Such causes could be one or more of several things:

1. The scorers may not have observed the same characteristics of behavior or noted the same characteristics in a product. This would indicate that either the scoring form is deficient or that the scorers need more training in use of the form.
2. The scorers may have observed the same things but applied different scoring criteria. This would indicate that either the scoring criteria are not clearly specified or that the scorers need to agree on the criteria.
3. The scorers may not have been able to observe all points of behavior because the action was too fast. This fault might be corrected by selecting only the most critical portions of the process to be observed, but this might invalidate the test item. If so, the scorers should develop greater skill in observing.



## EVALUATION OF INSTRUCTION

As emphasized in the introduction to this chapter, one of the most important functions of quality control is evaluation of the effectiveness of a training system, and we also emphasized the use of test results for this purpose. Test results alone, however, are not sufficient for adequate system evaluation. Non-test approaches should also be used to assess instruction, such as diagnosing the causes of trainee failure, if failures occur, and evaluation of instructors.

### USING TEST RESULTS

If students pass all items of all tests, then obviously the training system is effective. But when trainees fail some items, knowing about the failures does not specifically help us in pin-pointing the system's deficiencies. We must diagnose results of trainee test performance to learn what they did or did not do that constituted failure. The scoring data, as in Tables 3 and 4, when checked by the tester, will indicate what the trainee did not do that he was supposed to do, but they will not indicate what he did that was wrong instead of doing what he was supposed to do. This kind of information is needed to diagnose deficiencies, both in the trainee and the instructional system.

To obtain diagnostic information, a checklist of the kinds of things trainees do that are wrong instead of doing what they are supposed to do could be provided for the tester; or the tester might be requested to state what the trainee did that was wrong. Osborn (14) gives an example of a checklist that might be used to diagnose the

quality of instruction in a First Aid objective pertaining to the task of controlling bleeding from an external wound.

- ☐ Used wrong pressure point
- ☐ In right area, but missed pressure point
- ☐ Used incorrect hand position
- ☐ Applied too little pressure
- ☐ Applied too much pressure
- ☐ Pressure and release cycle improperly timed
- ☐ Did not continue procedure long enough

A list of this type would indicate why the trainee failed and where his learning was weak.

As illustrated in Table 4, the tester was required to check whether the trainee behaved in a non-threatening manner or in a professional manner, and in the scoring criteria section he was given what he was to look for as evidence of non-threatening and professional behavior. If he should judge that a trainee's behavior was threatening or non-professional, the tester was asked to state his reasons for making the judgment. Such statements would be another form of diagnosing trainee and instructional deficiencies.

Diagnostic lists, when checked-off during testing, provide a descriptive profile of deficiencies that can be used in remediating the individual student. It indicates why he failed and where the system was weak. Also, when collected from a number of test administrations, this diagnostic information usually provides a stable picture of reasons for failure that may be used to selectively revise and strengthen the instruction.

The system developer can use all diagnostic information to identify the units of instruction which are at fault, and he can then decide what should be done to improve instruction.

#### NON-TEST APPROACHES

Several techniques, other than diagnosing test results, are used to evaluate instruction. Most of these focus on evaluation of instructors by having outsiders, administrators, peers, and students rate the instructors on their performance. Even instructors are sometimes asked to rate themselves. The purpose of self-rating is to impress the person with the importance of his behavior as an instructor, and to obtain data which the person himself can compare with data obtained when others rated his performance. Some instructors are amazed to find that their self-images do not compare very well with their images as seen by others.

An article by McNeill and Popham (19) is perhaps the best single source of information on teacher or instructor assessment. In addition to an exhaustive bibliography, the article contains an excellent account of the merits of various approaches. Also, a book by Tracy (20) presents over 200 detailed checklists for use in recording data on the instructional environment and instructional techniques and resources.

Most non-test approaches to evaluation of instruction rely heavily on rating techniques. Although the rating method is a relatively easy way to obtain evaluation data, it is also a very easy way to obtain unreliable data. To assure the reliability of ratings, the

rater should be provided, as in testing, with a specific list of behaviors to be rated and with specific criteria for making the ratings. The raters should also be carefully instructed in how to apply the criteria to reduce the highly subjective nature of making judgments. Another source of unreliable rating data is the failure to have all raters observe the instructors under the same conditions and at the same time. Precautions should always be taken to control these factors which can contribute to the unreliability of rating data.

Finally, we must emphasize that when instructors or other aspects of instruction are being evaluated on the basis of purely performance or function, the effectiveness of instruction is not being measured. Evaluations of performance and function are made on the assumption that a given kind of performance or function will be effective in the instructional process, but the only way to evaluate the effectiveness of instructional performance and function is to measure the degree to which trainees attain the training objectives. In other words, opinions of instructional competence should never be used to supplant the scores of valid and reliable trainee tests of knowledge and performance as the primary basis for evaluating the effectiveness of a training system. This is not to say, however, that acting on the results of ratings cannot improve instructor performance and other system functions, but it is to say that the effectiveness of modifications in system performance and function cannot be known except by measuring trainee attainments of knowledge and job-task performance ability.



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## APPENDIX A

### TRAINING METHODS AND TECHNIQUES

Training methods, by our definition, consist of two or more training techniques. To aid understanding of methods, the techniques which make them up are defined separately in this Appendix.

Although techniques are mentioned in descriptions of method characteristics, the techniques which are essential to a method and all those which may also be included are shown in the "Matrix of Methods and Techniques" on the following page.

The designer of training need not be limited to the methods described here. He may also specify any of the techniques which he thinks will be most effective and efficient for a given purpose. This is another reason for the separate definition of techniques.

Of the 14 techniques defined, four are "Pure presentation techniques" (for presenting information to students). The remainder are "Augmenting Techniques" which may be used in conjunction with presentation techniques to create various methods.



MATRIX OF METHODS AND TECHNIQUES

| METHODS AND TECHNIQUES | Assigned Reading           |   | Direct Discourse | Exhibits | Indirect Discourse | Brainstorming | Discussion | Evocative Discussion | Forum | Programed Questioning | Prompting | Rhetorical Questioning | Self Confrontation | Stimulation | Student Query | Panel | Adjunctive Programing | Buzz Groups | Case Methods |         |             |                  | Conferences |          |         |           | Demonstration | Gaming                     | Job Instruction | Lecture | Hardware Oriented | Software Oriented | Human Relations   | Programed Instruction | Role Playing    | Seminar               | Workshop     |         |          |  |
|------------------------|----------------------------|---|------------------|----------|--------------------|---------------|------------|----------------------|-------|-----------------------|-----------|------------------------|--------------------|-------------|---------------|-------|-----------------------|-------------|--------------|---------|-------------|------------------|-------------|----------|---------|-----------|---------------|----------------------------|-----------------|---------|-------------------|-------------------|-------------------|-----------------------|-----------------|-----------------------|--------------|---------|----------|--|
|                        |                            |   |                  |          |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              | Harvard | Abbreviated | Incident Process | Dramatized  | Coaching | Problem | Refresher | Instructional | Correspondence Instruction | Demonstration   | Gaming  | Job Instruction   | Lecture           | Hardware Oriented | Software Oriented     | Human Relations | Programed Instruction | Role Playing | Seminar | Workshop |  |
| METHODS                | Adjunctive Programing      | * |                  |          |                    |               |            |                      | *     |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Buzz Groups                | x | x                |          |                    |               |            |                      | *     |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Harvard                    |   |                  |          |                    |               | *          | *                    |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Abbreviated                |   | x                |          |                    |               | *          | *                    |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Incident Process           | * |                  |          |                    |               | *          | *                    |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Dramatized                 |   |                  |          |                    |               | *          | *                    |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Coaching                   |   | x                |          |                    |               |            |                      |       |                       |           | *                      |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Problem                    |   | x                |          |                    |               |            | *                    | *     |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Refresher                  |   | x                |          |                    |               |            | *                    | *     |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Instructional              |   | o                | x        |                    |               | *          | *                    |       |                       |           |                        |                    |             |               | *     |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Correspondence Instruction | * |                  | o        |                    |               |            |                      |       |                       |           |                        |                    |             |               | *     |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Demonstration              |   | x                | *        |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Gaming                     |   | x                | *        |                    |               |            |                      | *     |                       |           |                        |                    |             | *             |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Job Instruction            |   | *                | *        |                    |               |            |                      | *     |                       |           |                        |                    |             | *             |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Lecture                    |   | *                | *        |                    |               |            |                      |       |                       |           |                        |                    |             | *             |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
|                        | Panel                      |   | x                |          |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Hardware Oriented      |                            | x | *                |          |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Software Oriented      |                            | x | *                |          |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Human Relations        |                            | x | *                |          |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Programed Instruction  |                            | x | o                |          |                    |               |            |                      |       | *                     | *         |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Programed Lecture      |                            | x |                  |          |                    |               |            |                      |       | *                     | *         |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Role Playing           |                            | x | *                |          |                    |               | *          | *                    |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Seminar                |                            | o | x                |          |                    |               |            | *                    |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |
| Workshop               |                            | o | *                |          |                    |               |            |                      |       |                       |           |                        |                    |             |               |       |                       |             |              |         |             |                  |             |          |         |           |               |                            |                 |         |                   |                   |                   |                       |                 |                       |              |         |          |  |

\* Techniques or methods always used in the method.  
 x Optional techniques or methods, not necessarily limited to only one, but at least one is essential to the method.  
 o Techniques or methods which may be included in the method, depending on the specific purpose of instruction.



## TRAINING TECHNIQUES

### PURE PRESENTATION TECHNIQUES

#### 1. Assigned Reading

##### Definition:

Printed materials from which the student is required to obtain information that is essential or helpful in attaining a training objective.

##### Characteristics:

Assigned reading may be books, booklets, manuals, periodicals, or handouts, including illustrations.

##### Applications:

To enrich (augment) classroom presentations.

To review classroom presentations.

To present information as the basis for classroom exercises, such as case information, roleplaying instructions, problem definitions, or practical-exercise instructions.

#### 2. Direct Discourse

##### Definition:

Formal or semi-formal oral presentation by one person to one or more students.

##### Characteristics:

Strictly telling the student what he needs to know without augmentation by other techniques, such as exhibits, rhetorical questioning, or student query.

##### Applications:

Seldom used as a pure technique, except in extemporaneous presentations on short notice or in answering questions.

The basic technique in the lecture method, and effectively used in oral-visual demonstrations and in coaching.

### 3. Exhibit

#### Definition:

A visual display to present essential or helpful information.

#### Characteristics:

Exhibits may be, for example, actual job-related equipment, models, mockups, graphics or pictorials (printed or projected), venetian blind or chalkboard displays, charts, posters, or sand tables.

#### Application:

In demonstrations and for any suitable illustrative or informative purpose.

### 4. Indirect Discourse

#### Definition:

Verbal interaction between two or among several persons which is not directed at, but is heard by the student.

#### Characteristics:

Indirect discourse may be, for example, a skit or a discussion between panel members after their direct discourse or lecture presentations.

#### Applications:

Skits to demonstrate effective principles of human relations, effective verbal communication techniques, or to present a problem-case for student analysis.

Discussion between experts to clarify points of agreement or disagreement as an aid to student understanding.

### AUGMENTING TECHNIQUES

### 5. Brainstorming

#### Definition:

Free expression of ideas by two or more students to generate as many ideas as possible on a given topic or problem without overt evaluation of them as good or bad, practical or impractical.

### Characteristics:

The most important characteristic is postponement of all critical or analytical discussion until the group has expressed all the ideas it can for later evaluation.

The leader or instructor writes the topic or problem (best phrased as a "how to" question) on a chalkboard or flip chart, encourages the group to express every thought that occurs, regardless of how far-fetched, and writes each idea in the order expressed, without trying to organize the list.

The leader ignores critical remarks (does not punish the evaluator) to avoid discouraging participants in making possible positive responses. Rather, the leader emphasizes and encourages creative thinking and empathic listening by all participants.

### Applications:

Particularly effective in developing creativity (creative thinking) and empathic listening skills, and in the initial stages of problem solving, decision making, and goal setting (as in team building).

Effective for generating ideas to be discussed in efforts to develop more objective and rational thinking.

## 6. Discussion

### Definition:

Leader- or instructor-controlled student sharing of information -- ideas, experiences, comments -- essential or helpful in attaining a training objective.

### Characteristics:

Orderliness is implied; the leader or instructor directs the discussion so that the focus of all students is on an analysis or enrichment of a topic.

### Applications:

Particularly effective in helping students understand concepts and principles (cognitive learning).

Effective in helping students to clarify their feelings, interests, and values and in modifying attitudes.



7. Evocative questioning

Definition:

Questions asked to evoke information from a student.

Characteristics:

Questions can be either thought provoking or those that require only a "Yes" or "No" response.

Applications:

To get feedback from the student as to the degree and quality of his learning.

To stimulate expression of ideas or discussion.

8. Forum

Definition:

Unrestricted student or panelist sharing of information -- ideas, experiences, comments -- helpful in attaining a training objective.

Characteristics:

Any participant is free to talk when he can get the attention of the other participants, but desired result is not a "bull session" or shouting match.

An instructor or a leader may be present to monitor the exchange but not to control it, other than perhaps to remind students, if they wander, that the discussion must be objective-related.

Applications:

A basic technique in sensitivity training. The form of discussion among panelists. Most effective in small groups, such as buzzgroups.

Effective for releasing anxiety and feelings of frustration generated by objectives which seem to students to represent more change than they can readily accept.



## 9. Programed Questioning

### Definition:

Questions used systematically to evoke a sequence of student responses in progression toward attainment of an instructional objective.

### Characteristics:

The questions may be multiple choice, or they may require a constructed response, either overt or covert.

If asked by an instructor (orally or by an exhibit) the responses must be overt to provide feedback to the instructor.

### Applications:

In programed instruction of all types.

In programed lectures (a form of programed instruction).

In adjunctive programing, in which the questions are used in conjunction with a textbook or manual (assigned reading) as self tests to aid learning.

## 10. Prompting

### Definition:

Instructor or coach assists one or more students by indirectly suggesting something forgotten or imperfectly learned.

### Characteristics:

Prompting may consist of giving cues for responses; partial concept or principle definitions; questions, such as "What must you do now?" "Which way do you position the part?" "What is the rule for \_\_\_\_\_?"; or single words to prompt a continuation of verbal expression. The variety is great.

### Applications:

In classroom instruction when the student fails to respond to a question.

In coaching a student in task performance.

In linear, constructed response programed instruction.

Particularly effective in teaching problem solving and in guiding thinking.

11. Rhetorical Questioning

Definition:

Questions asked and answered by a presenter, not intended to evoke overt student responses.

Characteristics:

Self-evident.

Applications:

In lectures and orations to emphasize points, stimulate thinking, keep the audience alert, or to direct audience attention.

12. Self-Confrontation

Definition:

Feedback to a student of his own behavior.

Characteristics:

The student behavior is sound-filmed, videotaped, or sound recorded and is then seen and/or heard by the student.

The student may be filmed or recorded in an actual job situation, but he most often is in a training situation.

Care must be used to prevent harm to the student, particularly in initial uses of the technique: the student must not be filmed or recorded without his knowledge or consent; he must be assured that the results will not be viewed or heard by others (not even the instructor) without his consent. (To ensure this, the student should have permission to destroy the film or erase the recording after his own private self-confrontation.)

If the student wishes, he may ask the instructor to be present at the viewing or audition to make helpful suggestions for student improvement.

Rarely should a student be asked to let the class review his performance, and then only when he has performed in an exemplary manner so as to be a good example of the behavior.

Applications:

Particularly effective in inducing the learning of human relations skills, as in superior-subordinate relations, persuasive skills (as in selling), interviewing and counseling, and in trainer training.

13. Simulation

Definition:

Any training exercise which involves the use of models, mockups, or functional devices to represent actual equipment.

Characteristics:

Simulation may be student use of a model to learn the part relationships or the function of equipment, use of a mockup to learn nomenclature or operating procedures, use of a functional device which partially or wholly represents the functional response of actual equipment to operator (student) manipulation of controls or application of checkout procedures, such as flight simulators or equipment malfunction simulators.

Applications:

In practical exercises for learning in preparation for practice or job performance with actual equipment.

14. Student Query

Definition:

Questions asked by the student in search of information from a classroom instructor, coach, panel, or an appropriately programed computer.

Characteristics:

Self-evident.



Applications:

To aid comprehension of abstractions, concepts, principles, processes and theories.

To gather facts helpful in attaining a training objective.

Should be permitted when feasible after a lecture or panel presentation.



## TRAINING METHODS

### 1. Adjunctive Programing

#### Definition:

Programed questioning used to augment assigned reading.

#### Characteristics:

A series of printed test questions, requiring answer choices or short written responses or both, is presented at the end of an appropriate segment of assigned reading, together with the correct answers that the student can see immediately after responding.

The questions are not of the programed instruction teaching frame variety but are the same as terminal frames would be if the assigned reading were programed.

In controlled experiments, students who responded to adjunctive programing after text study have demonstrated significantly higher levels of recall on retention tests than students who only studied the text. Thus, adjunctive programing has been proved as a test that also teaches.

#### Applications:

Suitable for any type of assigned reading the student must remember well.

### 2. Buzzgroups (Syndicates, Committees, Teams)

#### Definition:

Several small groups of students assigned tasks of producing products as part of a larger training design.

#### Characteristics:

The group should consist of no less than four and no more than ten students.

The groups may be given their assignments by direct discourse, lecture, or assigned reading. Each group may get the same or a different assignment.

Typical products required are lists of ideas, a solution or possible solution to a problem, short training presentations, plans, agendas, written or oral analysis reports.

A time limit is set and adhered to, unless the groups request more time.

The groups may use brainstorming or forum-type discussion.

Each group shares its product with the other groups in a combined meeting.

Applications:

Buzzgroups are effectively used for any purpose when large groups do not permit adequate participation of each student.

The method is particularly effective in developing a student-centered agenda, group objectives, and means of communicating among heterogeneous students; in compiling lists of problems, problem solutions, topics for discussion, or questions to be answered; and in preparing analysis reports.

Effectively used in team building, management and supervisory development, organization development, and trainer training.

Can be used in case methods for case discussion and analysis.

To focus student attention on critical issues before presentations, such as lectures, films, demonstrations, or roleplays.

To increase skill in problem-solving techniques, fact-finding, use of information sources, and decision-making.

3. Case Methods (Harvard Method, Abbreviated Method, Incident Process, Dramatized Method)

Definition:

Student discussions and analyses of cases, which represent problems in the students' job tasks, to determine the precise nature of the problems and to arrive at solutions or possible solutions.

### Characteristics:

#### a. Harvard Method

Printed lengthy and complex cases (assigned reading) which describe actual situations must be read before class meetings. Sometimes, individual student analyses must also be written before class meetings.

The instructor is active but non-directive in stimulating discussions and encouraging depth analyses.

#### b. Abbreviated Method

Printed cases (assigned reading), either fabricated or highly truncated actual cases, are read either before class meetings or when the sessions begin. Such cases point up only one of several major problems. Written individual student analyses may be required before discussion begins. Sometimes, related reading is required to give the student additional background.

The instructor is active but non-directive in stimulating discussions and analyses.

#### c. Incident Process

Students read a brief description of an incident which requires a decision. The group may ask for additional information, which the instructor gives, but if certain information is not requested he withholds it. Thus, students may make their individual decisions on the basis of incomplete information. Each decision is presented to the group and debated, with instructor pressure to arrive at a group conclusion. The instructor then presents the real, or preferred decision, and the students analyze their fact-finding and decision-making in relation to it.

#### d. Dramatized Method

Brief presentations of cases by roleplaying, film, videotape, or sound recording are discussed and analyzed. The cases may be either real or fabricated, and are usually limited to human relations or leadership problems.

The instructor is active but non-directive in stimulating discussions and analyses.



Applications:

a. Harvard Method

To increase awareness of issues, problems, and diverse viewpoints which may bear on single problems or issues.

To increase skill in problem diagnosis and insight into possible solutions.

To train executives, managers, and supervisors.

b. Abbreviated Method

Same as (a).

c. Incident Process

To increase skill in fact-finding and in assessing information needed for decision-making and problem-solving.

Other applications, same as (a).

d. Dramatized Method

Same as (a).

4. Coaching

Definition:

Use of direct discourse, evocative questioning, prompting, and student query to instruct and direct one or a few students in task performance.

Characteristics:

Self-evident.

Applications:

To develop psychomotor skills, as in equipment operation.

To teach procedures, such as checkout, form completion, disassembly-assembly, and tool-using.



5. Conference Methods

a. Problem Conference

Definition:

Discussion and analysis of problems by conferees who have backgrounds and experience related to the problems to arrive at group decisions on plans and execution of the plans to solve the problems.

Characteristics:

The leader presents the problems to the group by a brief lecture or direct discourse and the conferees draw upon their experience for possible solutions.

Brainstorming may be used in initial stages to generate ideas.

The leader directs discussion toward the conference objectives but does not give information; his role is to help the conferees clarify the problems and develop possible solutions on which the group is to ultimately agree.

Applications:

To develop insight into practical problems and possible solutions.

To increase awareness of diverse viewpoints which may relate to a single problem or issue.

To develop positive attitudes toward a training course and toward using what will be learned.

To gain acceptance of controversial ideas or objectives predetermined by the leader but also rationally arrived at by the conferees.

b. Refresher Conference

Definition:

Use of lecture to present new information and leader-controlled discussion and student query to clarify the information and to help the students decide how it can be used to improve their job performance.

Characteristics:

Self-evident.

Applications:

To upgrade relatively experienced incumbents in management, staff, and leadership positions.

To develop positive attitudes toward self-improvement and toward using new techniques or skills to improve job performance.

c. Instructional Conference

Definition:

Use of lecture, demonstrations and assigned reading to present information, and instructor-controlled discussion and student query to clarify the information and to help the student understand when and how he can use the information in performing his training or job tasks.

Characteristics:

Self-evident.

Applications:

To orient students toward the training objectives and the equipment, tools and materials they will be working with during practical exercises.

To motivate the student by helping him to understand his job responsibilities and their importance.

To teach and clarify basic concepts, terminology, and nomenclature.

6. Correspondence Instruction

Definition:

Self-instructional materials mailed to the student who mail-returns completed exercises and/or tests for evaluation.

Characteristics:

Assigned reading usually augmented by practical exercises. Recorded direct discourse and exhibits may be included. Programed instruction books or booklets may also be used, and standard reading may be augmented by printed programed questioning (adjunctive programs).

Applications:

For instruction in almost any subject when the student is unable to study in residence.

7. Demonstration

Definition:

Portrayal of a procedure, technique, or operation.

Characteristics:

May be oral, as in teaching verbal radio procedures.

May be visual, as in teaching an operation or the handling of equipment or materials.

Most often involves exhibits and direct discourse, but silent demonstration of some operations can be effective.

Skits (indirect discourse) can be used to demonstrate interpersonal skills, as in interviewing, coaching, or counseling.

Applications:

To show basic motor behavior required in the development of psychomotor skills, such as operation of tools and equipment.

To teach process completion, such as filling out forms, filing, telephoning, check-out procedures.

To present a model of desired interpersonal skills, such as in interviewing, counseling, or selling.



## 8. Gaming

### Definition:

A dynamic training exercise based on a model simulation of job functions which require student application of principles, ideational strategies, and mental and communication skills.

### Characteristics:

The game model is so designed that the students must make the same kind of operating and policy decisions and perform all the other critical behaviors that are required by their jobs.

The model provides for processing the results to produce a series of reports.

Most games require competition between individuals or teams or searches for "correct" answers or both. If competition between teams influences team decisions, the game is like tennis. If the competition is merely on quality of decisions, the game is like golf.

Games are played in time periods, each period being a day, week, month, or year, depending on the model. Thus, for example, if the time period is a month and one-half hour is allowed students to make decisions for each month, a year of experience and the year-long consequences of team behavior can be had in six hours (not including time required to process and read reports of consequences).

A wide variety of incidents can be programed into the model, such as acts of God, failures in communication or transportation, and equipment breakdown.

The simulation may be realistic, involving all job trappings, such as desks, in-out baskets, telephones, etc., all of which are used.

### Applications:

To develop skills in organization development, planning, decision-making, communication, controlling, forecasting, team-building, leadership, and problem-solving.

To teach more effective use of time, personnel, equipment, and materials.



## 9. Job Instruction Training (JIT)

### Definition:

A precise procedure for teaching job-task performance which involves oral-visual demonstration and coaching.

### Characteristics:

The specific JIT procedure consists of a series of steps in each of four sequential stages:

1. Prepare the student
  - . Put him at ease
  - . State the task
  - . Ask what the student already knows about the task
  - . Get him interested
2. Present the operation
  - . Tell, show, and illustrate
  - . Give only one step at a time
  - . Stress the key points
  - . Summarize the operation on a second run-through
3. Try-out performance
  - . Ask the student to perform the operation
  - . Note adequacy or inadequacy of key behaviors
4. Review and follow-up
  - . Reinforce the things done adequately
  - . Critique and repeat the things done inadequately

### Applications:

To prepare students to practice in developing psychomotor skills.

To teach any specific procedure.

To retrain experienced students in modified procedures.

## 10. Lecture

### Definition:

Use of direct discourse and rhetorical questioning or exhibits or both in one-way communication of information to an audience, large or small.

### Characteristics:

Self-evident.

### Applications:

To present factual, descriptive, or explanatory information as part of a larger training design, such as in a refresher or instructional conference.

To increase awareness of a problem, issue, or circumstance.

To motivate, persuade, and influence attitudes.

To orient students to training objectives and training activities, or to organization history, policy, purposes, or plans, etc.

## 11. Panel

### Definition:

Two or more persons who sequentially present information to a group by direct discourse or lecture.

### Characteristics:

Panelists usually are "experts" or "specialists" who speak on specified topics.

Sometimes, students who have prepared themselves may serve as panelists.

### Applications:

To present a variety of viewpoints to students.

To enrich the content of courses.

To give practice in speaking to students whose jobs require verbal facility.

Usually used in management development, instructor training, and professional conferences.

## 12. Practical Exercise

### Definition:

Student performance of actions specified in the training objectives.

### Characteristics:

In hardware oriented exercises, students perform in physical contact with machines, equipment, and tools.

In software oriented exercises, students deal with paper, manuals, and other materials and supplies used on the job to produce products (See "Workshop").

Principles and techniques of human relationships or organizational management are applied in simulated situations, such as in roleplaying and gaming.

### Applications:

To develop any skill, mental or psychomotor, required for job performance.

## 13. Programed Instruction

### Definition:

Instructional material presented in carefully prepared and sequenced segments (frames), each of which requires the student to respond, and immediately after each response the student learns whether it was correct.

### Characteristics:

The sequenced frames progress from simple to more complex levels and finally to attainment of the instructional objectives.

The student may respond to multiple-choice questions or to questions or contextual arrangements which require written responses, or to both in the same program.

The program may be printed or be presented by a machine, such as a visual or audio-visual device or by a computer.



The frames may be strictly linear (extrinsically programed) with the sequence determined by the programmer, or they may be arranged in branched sequences (intrinsically programed) with the sequence for a particular student being determined by his correct or incorrect responses.

The student progresses at his own pace.

Applications:

Can be used to teach any subject matter but is most often used to teach subjects difficult or too time-consuming to learn by other methods.

Particularly effective in improving the quality of training and in reducing training time and cost.

14. Programed Lecture

Definition:

Lecture augmented by programed questioning.

Characteristics:

One concept or principle or a small group of related concepts or principles or facts are presented at a time, immediately followed by a multiple-choice question to which the students respond.

Each student may respond by manipulating an electro-mechanical device at his station which registers the response on one of four meters at the instructor's position. This lets him know immediately the percentage of students who made each response; or the student may respond by other devices, such as holding up cards or turning blocks which the instructor can see. This feedback allows the instructor either to proceed with confidence that he is communicating well or to clarify the information and present the question again.

Applications:

Effective in teaching any subject matter that is amenable to lecture presentation but difficult for students to learn.



## 15. Roleplaying

### Definition:

Informal, unrehearsed enactment of situations in which students apply principles just studied or experiment with behaviors that are the training objectives or related to the objectives. The behaviors are then analyzed as they relate to the problems being studied.

### Characteristics:

The roles played must relate directly to problems of important concern to the students.

The performance must be as private as possible, especially the first session. This is accomplished by involving students in small, separate groups, each of which performs the same enactment as the other groups.

The discussion which follows is clinical and topic-related but does not evaluate the performance of any player; instead, the role behaviors assigned to the students are analyzed as they relate to the problem being studied and experienced.

Roleplays may be structured or unstructured and may be real or fictional. Structured roleplays are pre-planned, and a role is assigned to each student, usually in a written description of how he is to behave. Unstructured roleplays leave conceptualization of a role to each player. Unstructured roleplaying usually is used in dealing with real problems chosen for analysis by the students, but they can also be structured. Fictional roleplays also can be structured or unstructured. In both real or fictional roleplays, the students' feelings and reactions must be real if the method is to be successful.

Roleplaying involves at least direct discourse (and often assigned reading) and discussion. It may also involve student self-confrontation.

### Applications:

To apply principles just studied.

To experiment with possible behavioral solutions to a problem.

To develop interpersonal skills (interviewing, counseling, managing, supervising, instructing).

To develop empathy with others (by exchanging roles).

16. Seminar

Definition:

A group of advanced students who do or have done research in a field of study and then meet in the presence of a leader to present and discuss the research results.

Characteristics:

The students work independently in their research on assigned topics or problems of interest to all members of the group.

The leader may, but usually does not, participate in the research, but he controls the discussion to keep it oriented toward the training objective.

Student presentations may be simply direct discourse or lectures which include visuals or printed exhibits.

Printed copies of the research reports may also be distributed to the group.

Applications:

To professionally upgrade executives and managers.

To provide information and guidelines to policymakers.

To solve problems or provide possible solutions.

To plan administrative strategies.

17. Workshop

Definition:

Practical exercise in the application of newly acquired knowledge to develop skills by actually producing one or more products.

### Characteristics:

The instructor usually presents essential information by lecture and demonstration, answers student queries, and directs discussion, then coaches the students as they apply what they learn to produce a product. The product may be appropriate behavior, as in leadership or human relations, or a tangible product, such as a report or completed forms.

Roleplaying and self-confrontation may be used in developing human-relations skills, as in interviewing, counseling, selling, briefing, or instructing.

### Applications:

To develop or improve management and supervisory skills, particularly related to paper work and leadership skills.

To train trainers in all the production tasks required in their jobs.

To provide skill training to newcomers by reliable and expert incumbents.

To develop human-relations skills.